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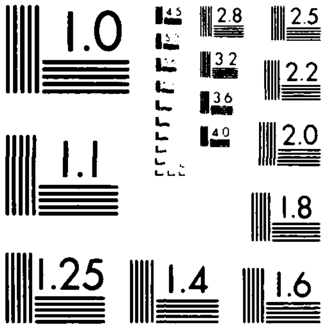


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# DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL REQUIREMENTS

Report DL502R1

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LMI

Executive Summary

# DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL REQUIREMENTS

The Defense Logistics Standard Systems (DLSS) make it possible to effectively requisition, issue, bill, ship, and account for all DoD items. However, they have become restrictive and technologically obsolete. If effective exchange of logistics information among the Services, Agencies, and Field Activities is to continue, the DLSS Office should update its policies, procedures, transaction formats, and other administrative processes. The Office must also redesign the Systems to ease changes in operational and informational requirements.

The requirements for DLSS modernization have been specified. The specification should result in DLSS: (1) that facilitate the exchange of information among the Services, Agencies, and Field Activities, (2) with forms and formats tailored to current needs, and (3) that will encourage effective use of advances in technology.

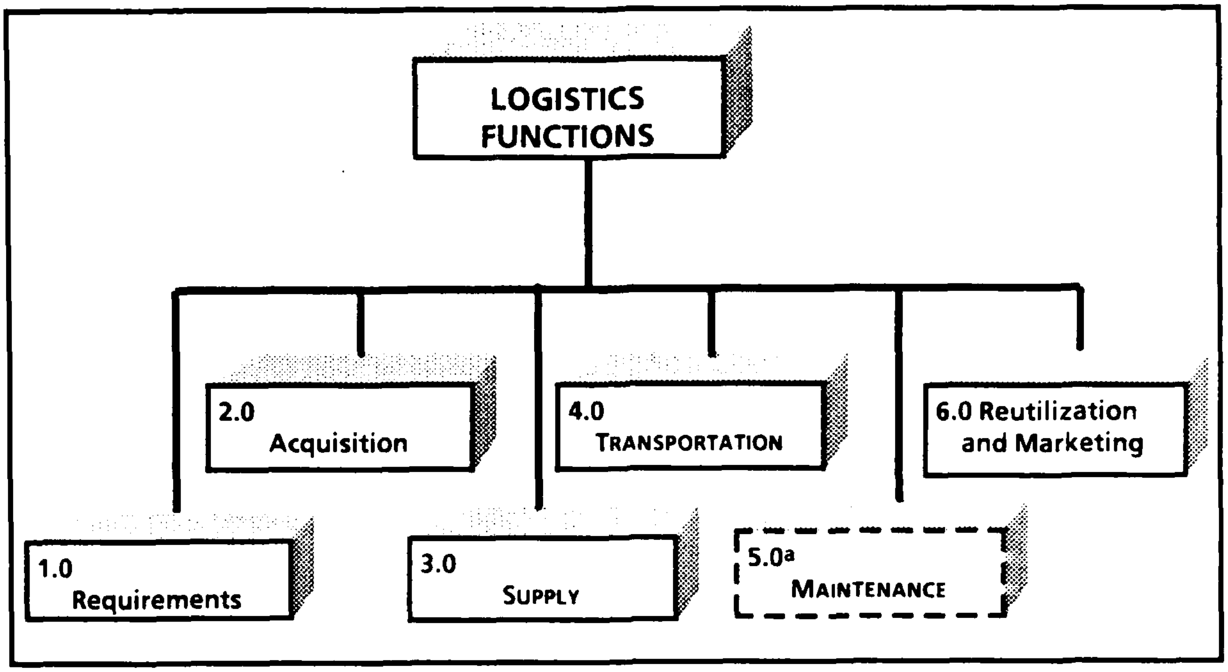
## ORGANIZATION OF THE REPORT

The Defense Logistics Standard Systems (DLSS) provide standard policies, procedures, and transaction formats to facilitate effective communication of logistics information among Service and Agency logistics systems. To achieve their goal, the DLSS prescribe logistics procedures for specific functional activities (e.g. requisitioning, billing, discrepancy reporting) and specify more than 400 transaction formats. The objective of the MOdernization of DEfense Logistics Standard Systems (MODELS) project is to improve the flexibility and capabilities of DoD inter-Service and Agency logistics operations and management information communications toward the goal of increasing overall effectiveness of logistics management.

While the DLSS have been slowly evolving during the past decade, the information processing and communication industries, which support DLSS information and communication requirements, have been improving in capability at a rapid rate. As a result of these changes, data management techniques have been improved, data processing is faster, methods of electronically communicating information between organizations have been improved, and logistics managers now have easier direct access to electronic information. The combination of these advances has created an environment with an increase in demand for *more information to be delivered to more logisticians on a more timely bases, in a user-oriented format.*

Logistics activities to be encompassed by future MODELS information communication standards and DLSS standardized procedures are shown in Figure 1. The functions enclosed in solid-lined boxes in Figure 1 are discussed in detail. (The maintenance function in the dashed box is not included because it is addressed by other DoD study teams.) Each function is analyzed to identify its component activities, define each activity element, indicate the extent of DLSS procedural coverage, and state the requirement for establishment of future DLSS interfaces under the MODELS concept. The requirements are in Part I of this report.

FIGURE 1. MODELS FUNCTIONAL ACTIVITIES




[a]Only interfaces are addressed in this study.

Part II discusses the following user interface and information exchange requirements and methodologies:

- Information exchange requirements that address inter-Service/Agency and Service-to-Joint Activities requirements
- Methods of data organization and information exchange that enable DoD to satisfy new logistics management information requirements, such as interactive processing, electronic mail, DBMSs, and data standardization
- Logistics management information changes, such as logistics management by weapons system and improvements in DoD asset visibility, that impose revised information processing and communications requirements on the DLSS
- Further development of DLSS goals and system conceptual design activities to reflect a functional viewpoint including all DoD logistics modernization projects within the scope of DLSS procedures.

Part III of the report discusses technical considerations related to meeting the functional requirements described in Parts I and II. It provides technology alternatives that will be used to develop the MODELS conceptual design as follows:

- Alternative communication network architectures
- Telecommunication technology and cost issues
- Capability of distributed data management.

Following Part III we present five appendices:

- Open Systems Interconnection Model (Appendix A)
- Information Resource Management Plan Outline (Appendix B)
- Communications Traffic Model (Appendix C)
- Data Base Management (Appendix D)
- Glossary (Appendix E).

In summary, this report of DLSS functional requirements describes how new information technology improvements affect (1) the need for exchanges of information among Services and Agencies, and Field Activities, (2) the specific needs of logistics managers for new forms and formats for logistics information, and (3) the requirement for updated standards that will encourage effective use of advances in technology to improve the exchange of information.

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# PART I: MODELS – DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL REQUIREMENTS

# CHAPTER A. SCOPE OF THE MODERNIZED DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL ACTIVITIES

The scope of the Defense Logistics Standard Systems (DLSS) is prescribed by Department of Defense Directive (DoDD) 4000.25, "Administration of Defense Logistics Standard Systems." The logistics standard procedures prescribed by DLSS publications are shown in Table A-1. To develop a conceptual design for the MOdernization of the DEfense Logistics Standard Systems (MODELS), it is necessary to evaluate the scope of the DLSS functions in the overall Department of Defense (DoD) logistics environment. Such an evaluation places the DLSS in perspective and also highlights the requirement to expand the scope of DLSS to include other logical interfaces and related functional areas. The analysis of the DLSS scope of responsibility presented here must be viewed as removed from existing organizational and functional breakdowns.

Figure A-1 is a functional activities work breakdown structure (WBS) diagram for the six second-tier logistics functions consisting of:

- Requirements
- Acquisition
- Supply
- Transportation
- Maintenance
- Reutilization and Marketing.

Each of these functions is described in Table A-2.

The scope of the *current* DLSS encompasses retail requisitioning, wholesale supply, transportation, contract administration, finance (billing), performance measurement of time segments in the supply-transportation pipeline, and logistics

**TABLE A-1. DEFENSE LOGISTICS STANDARD SYSTEMS PUBLISHED PROCEDURES**

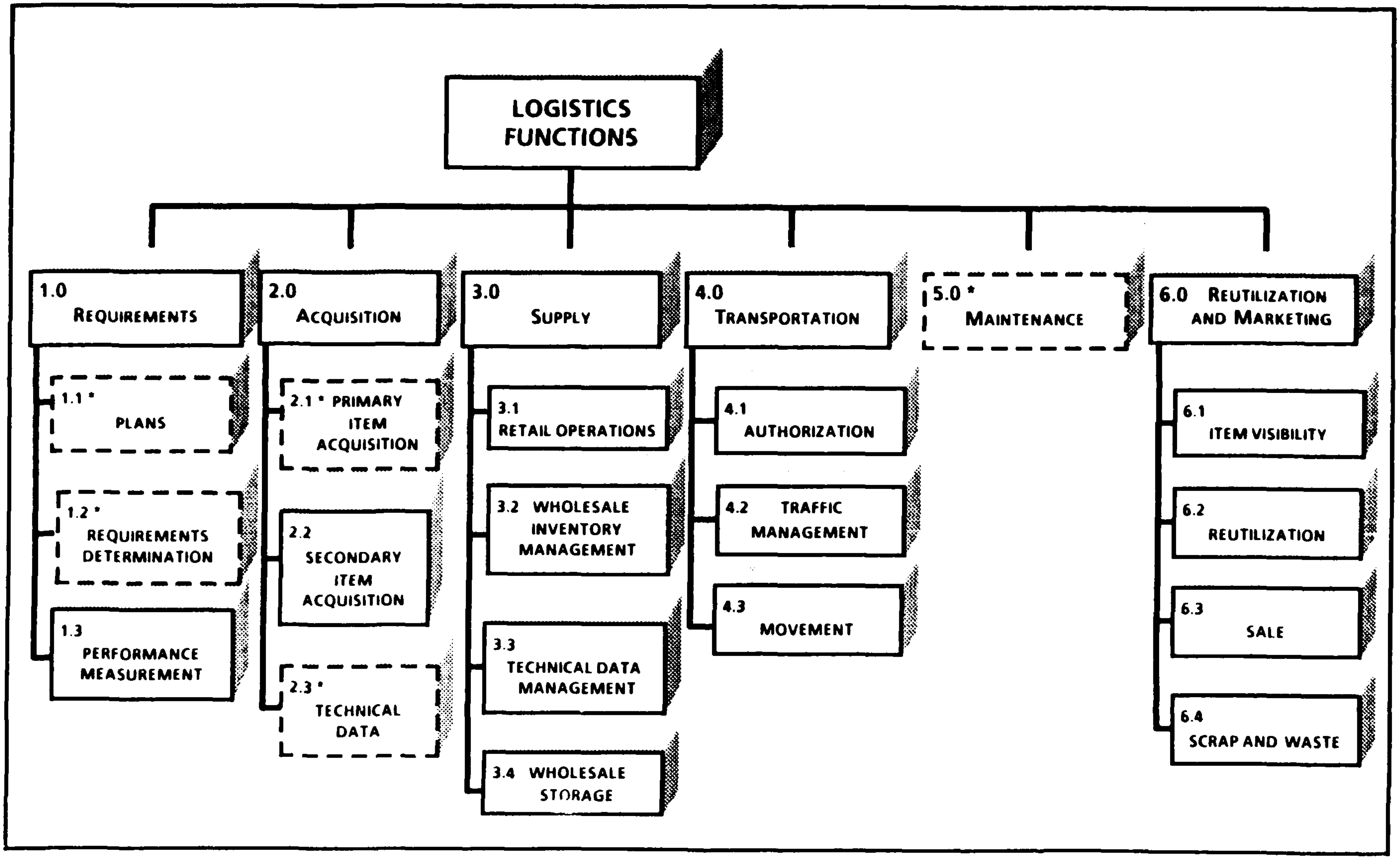
| ACRONYM | PROCEDURE TITLE |
|---|---|
| MILSTRIP | Military Standard Requisitioning and Issue Procedures |
| MILSTRAP | Military Standard Transaction Reporting and Accounting Procedures |
| MILSTEP | Military Supply and Transportation Evaluation Procedures |
| MILSTAMP | Military Standard Transportation and Movement Procedures |
| MILSCAP | Military Standard Contract Administration Procedures |
| DoDAAD | Department of Defense Activity Address Directory |
| MILSBILLS | Military Standard Billing System |
| MAPAD | Military Assistance Program Address Directory |
| MILSPETS | Military Standard Petroleum System (Procedures for the Management of Petroleum Products) |
| DAAS | Defense Automatic Addressing System |
| LOGDESMAP | Logistics Data Element Standardization and Management Program |
| ILCS | International Logistics Communications System |
| ROD | Report of Discrepancy |

data management. Although the MODELS design must cover these traditional areas, it should also incorporate other logistics elements to form a cohesive functional framework among DoD logistics operations and management. This WBS is developed for the MODELS project to facilitate the functional analysis and Phase 3 conceptual design. It is not intended as a recommendation for future DoD logistics management operations.

This chapter discusses issues associated with these six primary functional areas, followed by a detailed discussion of issues identified within each area.

Many logistics functions are not effectively interfaced with current DLSS procedures, including: requirements planning, inventory management functions such as stratification and stockage patterns, warehousing, retail (point of sale) issues, Continental United States (CONUS) transportation outside the Defense

FIGURE A-1. MODELS FUNCTIONAL ACTIVITIES WORK BREAKDOWN STRUCTURE




*Only functional interfaces are addressed in this study

**TABLE A-2. DESCRIPTIONS: LOGISTICS FUNCTIONS ENCOMPASSED BY MODELS**

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 1.0 Requirements | Identification of a need, supported by the necessary management action and planning to "project" that need in terms of anticipated operational requirements Identification of operational requirements is one basis for the development of logistics resources requirements Performance measurement of planned to actual, for both operational capability and resources utilization, is a principal means for improving future decisions and is a primary informational input to new requirements. |
| 2.0 Acquisition | Obtaining equipment, supplies, or services by contract through purchase or lease, regardless of whether the quantities to be acquired are already in being or must be created, developed, or demonstrated and evaluated. Acquisition begins when funds are allocated and apportioned It includes selection of sources, solicitation, award of contract, funding, contract administration, and those technical and management functions directly related to satisfying requirements by contract. |
| 3.0 Supply | Supply provides end items, equipment, and repair and replacement parts to operational and support units on an as-requested basis The supply process begins with the decision to acquire assets for immediate consumption or stockage against projected requirements The decision is implemented by submission of a requisition document into the supply system If the requested item(s) is not available at the retail unit, the requisition is processed through the supply system to the wholesale inventory management function During the requisitioning process, technical data may be required for initial item(s) identification or subsequent determination of acceptable substitutes. If the item(s) is physically available in the DoD supply system, the appropriate storage facility is requested to process the item(s) for shipment to the requisitioner Thus, the supply function includes: (1) retail operations, (2) wholesale inventory management, (3) technical data management, and (4) wholesale storage as major subfunctions for this MODELS analysis |
| 4.0 Transportation | The activities related to the movement of personnel, equipment, and supplies in support of military operations or other requirements It includes planning, authorization, routing, scheduling, and movement It also includes procurement of these services from commercial sources. |
| 5.0 Maintenance | Maintenance includes the process of overhauling, rebuilding, repairing, and replacing equipment and parts to maintain end items and their associated support equipment in a state-of-readiness to support defense missions and objectives The function of overhaul and maintenance develops policies and procedures that profoundly affect supply management policies and requirements. Data generated in maintenance operations are essential to sound determinations of the range of items carried in supply inventories and the stock levels to be maintained. Intelligence from maintenance functions can be invaluable to the supply manager for providing effective support to the operating forces Maintenance and supply management should be viewed as cooperative and integral teamwork having as its objective maximum effectiveness and efficiency. |
| 6.0 Reutilization and Marketing | The logistics processes associated with the receipt, classification, storage, reutilization, sale, and disposal of property excess to supply requirements. Basically, excesses are generated through one of two conditions. The first is obsolescence, or the decrease in utility of inventory assets as a result of technological changes that have brought about development of a new item or end equipment that now enjoys the demand The second cause is erroneous requirements input to the computation process resulting in too large a procurement for either provisioning or replenishments |

Transportation System (DTS), supply data file management, procurement procedures, and excess reutilization. For example, transportation coverage in the DLSS has been limited to DTS procedures, performance tracking, and shipment status and tracking. The Military Traffic Management Regulation (MTMR) and Transportation Discrepancy Report (TDR) are external to DLSS, and yet their interfaces are vital to effective accomplishment of logistics operations and information reporting.

As another example, MILSCAP established the kinds of contracting and contract administration information to be exchanged and the procedures for exchanging this information. The procedures promulgated in the MILSCAP have been influential in the development of the contracting and contract administration systems within DoD. MILSCAP procedures also implement and supplement contracting and contract administration procedures prescribed in the Federal Acquisition Regulation (FAR) and Defense Federal Acquisition Regulation Supplement (DFARS). However, MILSCAP has been inconsistently implemented by the Services and Agencies (S/As). Reutilization and Marketing (R&M) is considered by DLSS only for shipments to and requisitioning from Defense Reutilization and Marketing Offices (DRMOs). Although this important source of logistics inventory receives more than 3 million items annually, with original prices (i.e., current catalog Standard Price) totaling over $4 billion, only 16 percent is reutilized. This percentage might be improved substantially by full integration of available DRMO information into logistics information networks through MODELS.

The MODELS analysis considered the DLSS functions in the context of overall logistics information requirements and functional interfaces including and incorporating many functions not included in the current DLSS.

*MODELS Requirement:* Informational inputs and function-to-function interfaces (for example, supply-to-transportation) should be reevaluated and redefined to overcome known inter-S/A information deficiencies not addressed by the current DLSS and to meet the needs of new and expanding functional and management information requirements.

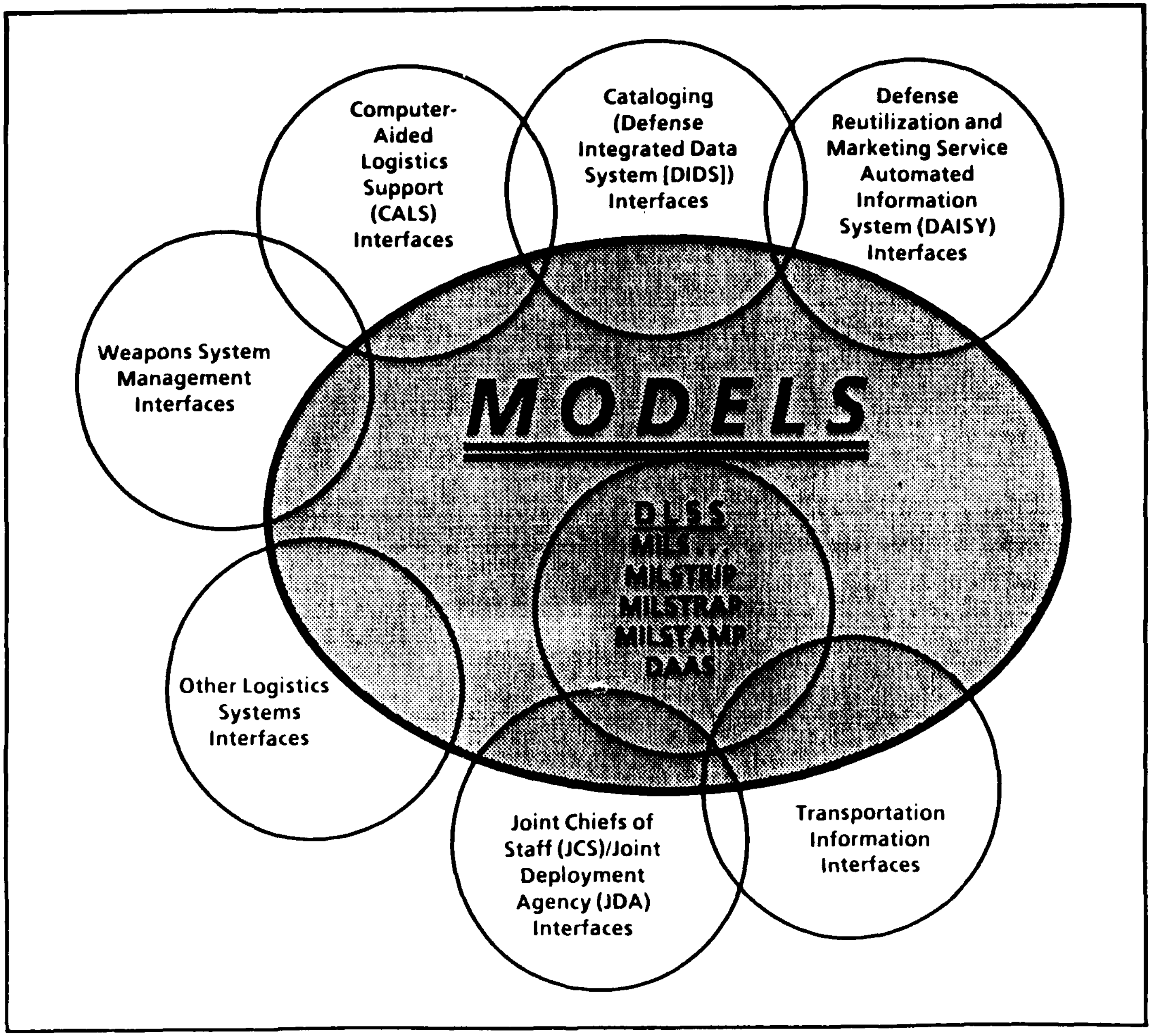
Figure A-2 illustrates the scope of the MODELS project as perceived by the project team and shows the relationship of the DLSS to project functional objectives. This illustration does not imply that the DLSS should develop standard procedures for all of these functions; rather, it reflects the need for information exchange standards throughout DoD to ensure easy, quick access to information vital to an effective, responsive logistics system. The Defense Logistics Standard Systems Office (DLSSO), as the organization assigned responsibility to administer standard logistics systems and programs, should have a major role in coordinating the implementation and interfaces between the many varied functions and systems needed to keep DoD logistics systems in the S/As communicating with one another while taking maximum advantage of developing information-processing technologies. The following subsections describe issues related to the environment and requirements for logistics information exchange.

Throughout this report many functional requirements are presented. Each requirement is offset like the *MODELS Requirement* stated on page I-5.

A.1 DLSS Transactions and Data Exchange Considerations.

Current DLSS standard transactions are difficult to change, often requiring a year or more to add or change a single data element, because of the time required for S/A staffing and implementation schedule coordination. To increase the scope of DLSS functional coverage and permit the dynamic information management necessary in the DoD environment, which encompasses organizations with different missions, the DLSS need variable-length and variable-field transactions.

FIGURE A-2. SCOPE OF MODELS PROJECT



These transactions must be usable in interactive as well as batch processing. They must also provide a capability for Service-unique data to be carried (transparent to supply source and other external processing points) or removed when the transaction leaves the specific S/A environment and restored when response transactions (e.g., requisition status) re-enter the original S/A environment. Service-unique elements that apply in DoD-wide common functions will be prime candidates for general inclusion in the system thereby improving all inter-S/A communications as well as information exchange control.

> *MODELS Requirement:* The MODELS conceptual design must provide flexible transaction formats and a methodology for expedited adoption of new codes and procedures as logistics operations and management information needs change. (This characteristic is discussed in more detail in Part II, Section B.2.)

The Uniform Materiel Movement and Issue Priority System (UMMIPS), which is not now within the scope of DLSS administration, provides the basic standards for Force Activity Designator (FAD) assignment and materiel issue and transportation prioritization, as well as the maximum time standards for processing segments, the frequency of follow-ups, and response time frames. Additional layers of sequencing rules have developed and should now be incorporated in UMMIPS.

> *MODELS Requirement:* UMMIPS performance measurement standards and procedures should become part of the restructured, expanded DLSS, and must continue to be closely coordinated with the Joint Chiefs of Staff (JCS) for FAD and priority assignments. (This requirement is discussed in more detail in Part I, Chapter C.)

MODELS will require development of standard retention periods to support different types of inquiries and historical-chain-of-events reporting. Those retention standards will be developed for on-line and batch files.

Some critical transaction edits are now performed by a third-party (DAAS), and edit and validation rules and criteria are geared toward batch processing.

Under MODELS, value-added processing at a central site may be reduced if not eliminated. Nodal or gateway processing may be performed under standardized rules. Therefore, supply source front-end edit and validation processing may be greatly reduced. Outright rejection of erroneous transactions may be replaced by transaction suspension with on-line inquiry to the transaction origin for near-real-time error correction. The extent to which nodal or gateway processing can be used in improving logistics information flows still needs to be determined although it will certainly be a factor. These issues are discussed in Part III, Chapter A of this report.

> *MODELS Requirement:* MODELS will require some degree of data base and data model standardization.

The current DLSS provide standard interfaces and accompanying rules for information exchange. The logistics system inputs and outputs need to be defined as standard information exchange requirements, not necessarily specific, fixed-transaction formats. However, the information exchange requirements need to be stated with standard data elements and rules of recognition. Alternative concepts for revised DLSS transaction formats are discussed in Part II, Section B.2. MODELS may rely on gateway or front-end telecommunications/computer equipment processing to provide translation to DLSS standards, as transactions go to and from S/A systems. In that case, MODELS would define internodal transactions for information exchange and event/status reporting/recording. This topic will be analyzed in depth during Phase 3 of the MODELS project. Issues in both telecommunications and distributed data base management affecting this analysis are presented in Part III, Chapters B and C, respectively.

The DLSS have traditionally concentrated on external transactions, providing a tightly controlled framework for common transactions between incompatible systems. The DLSS were promulgated to overcome S/A system incompatibilities and provide an S/A bridge but not to supplant S/A internal systems. However, because of

the generally successful implementation of the DLSS data elements, they are at the core of every logistics system and the internal-versus-external distinction is often hard to maintain. Today, many internal S/A transactions parallel the DLSS. Ideally, internal S/A transactions would be completely replaced by the DLSS. In practice, however, internal transactions bearing DLSS document identification codes will also contain unique codes.

> *MODELS Requirement:* The MODELS concept must provide the capability for internal S/A-unique data needs to be accommodated in DLSS inter-S/A transactions.

Today, the internal S/A usage of DLSS standards for information exchange can become a trap. When DLSS changes are mandated, they may undermine previous conforming internal usage. Because such internal usage does not usually carry a DLSS blessing, a DLSS change can disrupt S/A internal processes that are tied too closely to the former DLSS usage. Internal S/A systems are to some extent locked into the current DLSS architecture, and that may become an impediment to change. The very success of the DLSS has bred S/A systems dependent on current transaction formats and 80-column records. In instances in which DLSS are fully incorporated into S/A internal logistics operation, the S/A will often attempt to restrict the extent of a DLSS change to protect its own system maintenance requirements.

Generally, the S/A will choose to apply basic standards with add-on uniques rather than implement totally nonstandard methods. S/A procedures of various types deal with basically common problems and needs. Some develop into Proposed MILSTRIP Change Letters (PMCLs) and standard procedures. Even those that do not become standard tend to be based on existing DLSS standards. Under MODELS, a more open transaction structure architecture should encourage use of standards in internal S/A systems. Service-unique codes and special transactions will not degrade MODELS-structured processing as long as the Service-uniques do not

supplant the DLSS standards and are not imposed on others. This MODELS flexibility should encourage gradual dominance of the DLSS in intra-S/A processes without external imposition.

Currently, arrangements between two or more S/As are used to handle logistics interfaces and information exchange requirements. Most occur because the need is restricted to the two parties or because the DLSS either cannot respond to the need or would take too long to change to meet the need. These agreements between S/As handle interfaces and information requests not covered by the DLSS. However, some of these agreements are common requirements throughout the logistics community. It would be beneficial to the DLSS to accommodate such interfaces under MODELS, providing visibility as well as a springboard for eventual standardization.

> *MODELS Requirement:* MODELS transaction formats must provide flexibility to handle two-party and multi-party informational exchanges, even though not formally part of DLSS procedures.

Informational outputs from supply sources and other processing points (e.g., contract abstracts, materiel release confirmations) are also prescribed by DLSS. In addition to issues regarding inputs and interfaces, other issues apply to output transactions:

- Outputs must continue to include standard core data.
- The MODELS concept must consider pull-and-push information needs separately.
- On-line inquiry capability must be provided.

> *MODELS Requirement:* A standard DoD logistics data elements dictionary will be a requisite (and a responsibility of the DLSS); it will have to include all data elements, terms, and definitions used in S/A logistics system interfaces and information exchanges. The basis for this dictionary should be LOGDESMAP.

A.2 Requirements Drivers.

Current DLSS are designed to provide interfaces and information. The MODELS concept must consider the users of logistics information and the requirements of customers.

Current DLSS are not structured to allow for differences in the mission or nature of user activities. MODELS needs to recognize these distinctions. For example, at base/unit locations, such concerns as procurement leadtime and safety level are shared with wholesale organizations. This is particularly true for locally purchased items, including items on the General Services Administration (GSA) schedule and critical items on backorder. Therefore, retail levels should be considered in the overall inventory management picture.

> *MODELS Requirement:* Modernized DLSS must provide for standardization of retail procedures.

In crisis or wartime situations, deployment and resupply become critical. Identification, allocation, and tracking of selected materiel are the main issues, and the ability to divert selected critical materiel may be desirable. Force requirements should be translated into supply sustainment terms. The present plan to batch-release resupply requirements according to contingency plans needs to be addressed; the most effective resupply procedures in light of available technology must be accommodated in the MODELS conceptual design. Also, the option should exist to allocate assets under several different criteria, such as theater of operations, selected high priority projects, or selected field units, ships, or activities.

*MODELS Requirement:* The MODELS concept must coordinate with all S/A logistics modernization requirements. It must also be able to satisfy logistics information requirements and fully support resupply requirements in crisis or wartime situations.

A.3 Logistics Interfaces.

The DLSS are concerned with interfaces between logistics functions and logistics organizations, primarily where S/A lines are crossed. Traditionally, S/As have insisted on the prerogative to develop and use different and often unique internal transactions. This prerogative has been justified by the assertion of differing organizational activities based on differing missions. Naturally, data architectures and file structures that reflect these unique traits have developed. Although current DLSS have served to bridge these differences by forcing external transactions into rigid molds, this solution limits interoperability and causes the omission of unique data. Some interfaces that are omitted under the current DLSS should be included under MODELS.

*MODELS Requirement:* The MODELS conceptual design should accommodate all information exchanges between inter-S/A logistics functions and operational/management components.

# CHAPTER B. PERFORMANCE MEASUREMENT FUNCTIONAL REQUIREMENTS

This first MODELS five-year planning horizon addresses only the Requirements logistics function activities encompassed by performance measurement. The other two Requirements functions, Requirements Planning and Requirements Determination, particularly as related to secondary items, should be considered in the scope of MODELS for a mid-1990s modernization program.

Performance measurement is the process of evaluating past logistics operations, and in logistics, as in any discipline, it is the cornerstone of effectiveness. To manage logistics resources effectively, management of every logistics process at all levels must have continual access to timely performance indicators. Performance measurement data may come from many sources as long as the data are accurate, timely, accessible, consistent between organizations, and in usable and understandable form. Historically, throughout DoD, logistics performance measurement data have been defective in at least three of these five areas – timeliness, consistency, and accessibility.

Lack of timeliness and accessibility of DoD logistics performance measurement data is usually a function of limited automatic data processing (ADP) resources and data communications. Most data available for performance measurement are now provided to logistics managers in an off-line mode. Much of the data are many days or even months old and are either inaccessible or accessible in unusable formats only. In many cases, the data needed for immediate identification of performance deficiencies and application of corrective measures never reach the appropriate managerial levels. Problems go unnoticed, with their causes never ascertained because no performance indicators are available.

Performance indicators and reports, as defined in MILSTEP, have been standardized throughout DoD. However, each S/A has its own way of measuring performance, as does every organizational and functional activity. Accordingly, flexibility in the use of performance measurement data is not only desirable but necessary. Standard presentation formats must be available. However, even standard reports should be easy to tailor and revise to meet special information requirements or changing management requirements on a timely (1 – 2 months) basis.

Flexibility for the purpose of measuring performance requires on-line access to logistics data throughout DoD, factored by such characteristics as weapons system, commodity/class, type of activity, or other groupings desired by management. These factored groupings should be accessible to managers at appropriate levels for all DLSS functional areas in unrestricted formats, without any need for extensive resources or expertise in special software programming. This means that standardized performance measurement data should be available through an easy-to-use, on-line, menu-driven capability. Only the owner of the data base should be able to restrict access to the information and then only for reasons of security or protection of proprietary rights.

> *MODELS Requirement*: The MODELS concept should include the capability to (1) accumulate performance characteristic data generated as a normal process of daily operations, and (2) provide for the retrieval of performance data in a form that the intended recipient will find most useful. This capability should include collection of data, based on normally generated operations data (not special data collection efforts), and rapid retrieval in easily modified formats, to view information from different points of interest.

Performance measurement requirements can be divided into five functional areas: (1) retail inventory management, (2) wholesale inventory management, (3) supply-transportation pipeline, (4) contracting, and (5) weapons system management. This structure is shown in Figure B-3 and described along with other WBS functions in Table B-3.

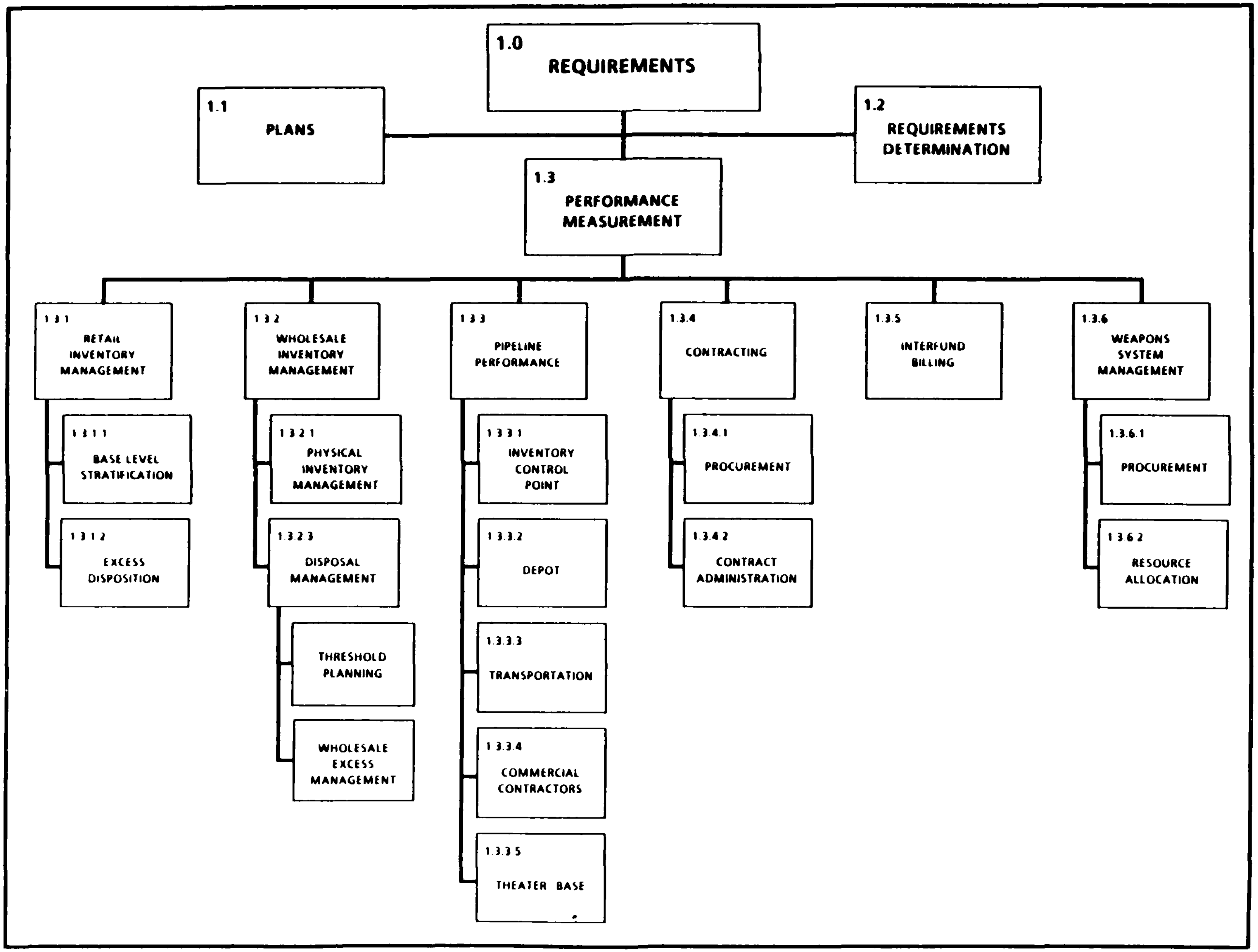
B.1 Retail Inventory Management.

At the retail level, managers are tasked to support specific base-level requirements. These base-level requirements must be continually satisfied without significant interruption. Performance measurement is a key to these logistics support efforts in that adverse trends must be detected and corrected before serious negative effects result. Similarly, positive trends must be identified and analyzed to make sure they continue.

Two classical factors for measuring performance in retail inventory management are *fill-rate* and *inventory turnover rate*. *In combination*, these two measurements can act as a check and balance, in that neither rate should move beyond predefined upper and lower boundaries. Additional performance measurement criteria must be defined to encourage effective weapons system management (see Part II, Section C.1). Sound performance indicators at the retail level have a profound and cost-beneficial effect throughout the logistics system. Therefore, it is important that timely, accurate measures be prepared and distributed throughout the command chain. In addition, comparisons with other retail activities having similar operations should be performed for evaluation of resulting indicators and broader dissemination of good management techniques.

> *MODELS Requirement:* The MODELS concept should include methods for collecting and reporting data at the retail operations level to satisfy a variety of performance measurement criteria.

FIGURE B-3. PERFORMANCE MEASUREMENT FUNCTIONS



## TABLE B-3. DESCRIPTIONS: PERFORMANCE MEASUREMENT FUNCTIONS

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 1.0 Requirements | Identification of a need, supported by the necessary management action and planning to "project" that need in terms of anticipated operational requirements. Identification of operational requirements is one basis for the development of logistics resources requirements Performance measurement of planned to actual, for both operational capability and resources utilization, is a principal means for improving future decisions and is a primary informational input to new requirements. |
| 1.1 Plans | Identification of what items are necessary or are likely to be necessary for procurement in a future time period to support various defense missions. It ensures the proper consideration of prime equipment and its associated support on an integrated basis. Logistics planning functions include interpreting system requirements for design supportability and logistics support, identifying program functions and tasks, identifying funding sources and preparing cost estimates, and defining the organizational structure responsible for implementation of the tasks identified |
| 1.2 Requirements Determination | Development of basic inventory requirements for equipment, spare parts, and other items to support operating systems throughout their expected life-cycle. Composed of initial provisioning and replenishment phases, requirements determination includes development and execution of basic stockage policy, forecasting of demand and leadtime, derivation of required levels of inventory, and management of nondemand-based items. Considerations include interfaces with each maintenance level and each geographical location where spare/repair parts are stocked or distributed, spares demand rates and inventory levels, procurement leadtimes, and methods of distribution |
| 1.3 Performance Measurement | Comparison of current performance with pre-established mission objectives or goals The extent and degree of monitoring required depends upon the size, complexity, and urgency of the project Supply performance goals are established by the DoD Components. Supply system response time standards are stated in UMMIPS procedures. Separate performance goals may be established for a category of items, a type of activity, or a special management grouping. |
| 1.3.1 Retail Inventory Management | Effective control procedures enable the retail supply level to limit the number of items on hand to those needed for immediate and projected requirements. A principal difficulty is that of forecasting future requirements with a reasonable degree of accuracy. Determination of the quantity of any given item required to meet future needs is affected by such considerations as cost, rate of use, reparability, rate of obsolescence, and records of past usage. Essentially, inventory control involves analysis and interpretation of these data, recognition of trends, and determination of the desired stock level. |
| 1.3.1.1 Base-Level Stratification | Once the process of requirement determination is made for an item for every purpose, it becomes necessary to combine all these data and develop a single requirement. The method by which this is accomplished is called base-level stratification. The basic principle is to compare inventory assets to authorized levels and price out the deficiencies and overages in the various strata elements The conditions portrayed by the collective data, as well as individual item condition, can highlight stewardship at the retail level and, to a degree, at the wholesale level |
| 1.3.1.2 Excess Disposition | Excess is determined by application of economic retention criteria during the periodic process of requirements determination. The retention formula shows at what period the cost of retaining an item is equal to the cost of disposing of it with the knowledge that procurement may still be necessary at a later date. Retention costs include storage space, care and preservation, stock surveillance, deterioration in storage, and obsolescence On-hand balances above the retention limit are categorized as excess and are subject to the various screening and utilization processes of the DoD R&M Program. Excess property is shipped from the retail level to the wholesale level, as directed by the wholesale inventory management. |
| 1.3.2 Wholesale Inventory Management | The process of determining the appropriate range and quantity of items that will be carried in inventory at DoD depots and storage locations. The inventory control points (ICPs) receive requirements from customers to stock specific line items to support special projects or programs (non-demand based items/levels). Stock levels are periodically reviewed based on recent historical demand, and the range and quantity of inventory is adjusted accordingly Inventory items are prioritized by essentiality, and final levels are determined by available funding |

**TABLE B-3. DESCRIPTIONS: PERFORMANCE MEASUREMENT FUNCTIONS (CONTINUED)**

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 1.3.2.1 Physical Inventory Management | The receipt, stowage, and accountability of all materiel The examination, verification, and acceptance of materiel are included in the process of receiving materiel Materiel is weighed, cubed, and sized upon receipt and assigned a storage location that conforms to these specifications as well as consideration of hazard, security, and pilferable items, and item demand frequency Based on Materiel Release Orders (MROs), materiel is picked and forwarded to shipping for distribution Detailed accounting records are maintained by both the ICP and the depot The ICP maintains the official property accountability record. Physical inventory counts are performed at the request of the accountable activity (ICP) or when potential or known record discrepancies exist or are discovered by either the ICP or depot. |
| 1.3.2.2 Disposal Management | The functions of determining what portions of inventory can be economically retained and what should be declared excess belong to the ICPs in the Services and to the Defense Logistics Agency (DLA). Item managers are responsible for determining retention limits during the process of requirements determination. Excesses are determined by the ICPs using economic retention criteria as part of the process of requirements determination The retention formula shows when the cost of retaining an item is equal to the cost of disposing of it, with the knowledge that procurement may still be necessary at a later date. Retention costs include storage space, care and preservation, stock surveillance, deterioration in storage, and obsolescence On-hand balances above the retention limit are categorized as excess and are subject to the various screening and utilization processes of the DoD R&M Program |
| 1.3.3 Pipeline Performance | A few exceptional types of supply actions are not subject to MILSTEP measurement, but basically the system applies to all supply transactions requisitioned from ICPs and shipped from Government wholesale stocks, including GSA, to DoD activities within CONUS and from there to overseas air and water ports of debarkation MILSTEP measures total pipeline performance from the date of the requisition to the date materiel is offered to the consignee's transportation officer or delivered to the parcel post addressee. Receipt takeup, an integral part of the supply-issue-transportation process, is also measured as a discrete segment. In the case of overseas shipments through DTS, measurement now stops when materiel is discharged at the point of discharge or lifted from the air port of discharge In the DoD system of performance measurement, MILSTEP methods are used to evaluate actual performance against the UMMIPS time standards |
| 1.3.3.1 Inventory Control Point | The ICPs record the time of receipt of all customer requisitions. Comparisons of this time with the date of requisition preparation (an integral part of the requisition number) reveal the amount of time taken for the cycle segment-requisition submission The ICPs and depots automatically record the time when their portion of the process has been completed, and these time factors provide the means to determine actual processing times used by wholesale supply activities Many other ICP activities are measured by individual organization directive but are not now standardized throughout DoD |
| 1.3.3.2 Depot | The depots automatically record the time when their portion of the process has been completed, and these time factors provide the means to determine actual processing times used by wholesale supply activities Many other depot activities have performance measurement standards as directed by respective S/A requirements. However, these measurements are not now standardized throughout DoD |
| 1.3.3.3 Transportation | To determine transportation performance, shipping activities produce a series of in-transit data records These in-transit data cards (IDCs) are designed to measure, in terms of time, the receipt and subsequent lift of a shipment through each transportation node This includes the shipper (storage location or vendor), each intermediate point of rest (transshipment mode/ carrier) on the route, and receipt by the customer (at the receipt dock) The IDC accompanies other shipping papers along the entire transportation route After materiel delivery, the IDC is used to interface with its corresponding supply data to provide the transportation measurements for total pipeline performance effectiveness, as required by UMMIPS |
| 1.3.3.4 Commercial Contractors | Most materiel and equipment is produced by and acquired from commercial vendors through contracts. These contracts prescribe the materiel to be delivered to the Government, including quantity, technical specification, testing requirements, and date and location for delivery In contracts where progress information is necessary, the two factors of interest are the actual progress toward completing the work and the funds spent to achieve that progress Other contracts performance measurements may include the commercial contractors attainment of contractual obligations such as schedule, quantity, and quality |
| 1.3.3.5 Theater/Base | Upon receipt, the customer completes the IDC with "date received" and dispatches it to the central data collection point by the Automatic Digital Network (AUTODIN) for use in calculating the in-transit time period Thus, the loop is closed and the MILSTEP system can determine whether the customer received timely fulfillment of his requisition and the amount of time required for each segment of the supply pipeline |

## TABLE B-3. DESCRIPTIONS: PERFORMANCE MEASUREMENT FUNCTIONS (CONTINUED)

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 1.3.4<br>Contracting | One of the principal controls on military contracting is exercised through the appointment of contracting officers. The authority to execute and administer contracts is derived from the basic authority vested by statute in the Secretaries of the Military Departments. A contracting officer whose primary responsibility is to enter into contracts is called a procurement contracting officer (PCO); a contracting officer whose primary responsibility is to administer contracts is called an administrative contracting officer (ACO). In addition, a contracting officer responsible for termination and/or settlement of terminated contracts may be referred to as the termination contracting officer (TCO). A single contracting officer may be responsible for duties in any or all of these areas. The contracting officer actually functions as the leader of a team of experts whose advice and counsel cover the entire contract area. The team members include engineers, auditors, price analysts, lawyers, quality assurance specialists, transportation specialists, negotiators, and others as necessary – all specialists in their fields. |
| 1.3.4.1<br>Procurement | The acquisition of materiel, equipment, or services from commercial vendors through competitive or negotiated purchase orders or contracts. Procurement requirements and specifications are developed and defined by the technical program personnel. The procurement process is performed by a designated PCO. Many aspects of the procurement process can be measured for effectiveness, including procurement leadtime, level of competitive procurements, procurements awarded to small or minority-owned businesses, and number and dollar value of unpriced orders placed by ICPs. |
| 1.3.4.2<br>Contract Administration | Performance management of a contract is the primary responsibility of the contract administration office located at the contractor's plant. An ACO at the contract administration office is assigned one or more contracts to serve as the focal point for all field matters, administrative as well as technical. A team of specialists is available to provide support in meeting this responsibility. Among the continuing functions of contract administration, the most important are surveillance of the contractor's progress toward completion, as well as maintenance of a constant flow of information to the procuring activity on the status of contracts. The performance evaluations measure performance against schedule for such major elements in the production cycle as planning, subcontracting, material purchase, plant set-up, tooling, component manufacture, subassembly, final assembly, testing, and delivery. The extent and degree of monitoring required on a particular contract depends on the size, complexity, and urgency of the project. On specific cost-reimbursement contracts and on limited numbers of others, the monitoring of incurred costs and other selected financial data is an important means of assessing contract progress and maintaining close surveillance. |
| 1.3.5<br>Interfund Billing | An automated billing and fund transfer system, under which a billing office forwards an automated billing (detail billing records, a summary billing record, and the necessary fund transfer information) to a billed office. During the same month, the billing office advises its central accounts office of the interfund transfers (self-reimbursements) it has made. The central accounts office reports these transactions to the U.S. Treasury and to the central accounts office of the office whose funds have been disbursed. The billed office's central accounts office maintains a suspense file to ensure that the charge is cleared. The billed office, through processes unique to each Military Department, clears interfund disbursements by either accepting the charge or taking action to have the billing office reverse the transfer. |
| 1.3.6<br>Weapons Systems Management | The weapons systems logistics plan leads directly to scheduling of the various logistics activities such as purchase of repair parts and modification, overhaul, and repair. These schedules are used to: contract with industry for spares; program aircraft, engines, ships, and accessories for overhaul and modification; and place with industry the work that cannot be accomplished in Service facilities. As these actions are taken, feedback is provided to the logistics support manager who can determine whether schedules are being met and what measures may be needed to overcome delays. The project manager is responsible for managing a high-priority weapons system or major item of equipment through all stages, from research and development (R&D) until delivery to the using unit. The recent emphasis on weapons-system-oriented logistics management may create a demand for weapons-system-oriented inventory managers (IMs) at S/A ICPs responsible for managing a weapons system or major item of equipment after it is deployed to using units. |

**TABLE B-3. DESCRIPTIONS: PERFORMANCE MEASUREMENT FUNCTIONS (CONTINUED)**

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 1.3.6.1 Operational Availability Planning | Except for ships and submarines, a weapons system is considered operationally available if it is "Full Mission Capable" as defined in DoDI 7730.25. A naval surface or subsurface weapon system is operationally available if it does not have an outstanding Casualty Report (CASREP) under the Navy Casualty Summary Reporting System. Operational availability is usually defined as weapons system uptime divided by total weapons system availability time. The rates for a type of weapons system are the averages of the rates for individual weapons systems of that type in the operational inventory. Weapons systems undergoing scheduled overhaul should not be counted in the operational inventory.<br>Operational availability planning requires every major function of the logistics process to reorient from a commodity-oriented perspective. Performance measurements related to weapons-system-identified items will need to be segregated with different standards of excellence applied. Standards for supply response time, backorders, and fill rates should be based on optimization analysis to determine the performance necessary to support end-item availability requirements. |
| 1.3.6.2 Resource Allocation | This function within a weapons-system-management-oriented logistics environment directs a shift from the traditional objective of meeting commodity fill-rate goals to the objective of meeting weapons-system-operational availability goals. This may dictate development of multiechelon optimization models that will generate inventory requirements for wholesale, intermediate, and consumer levels to support weapons system availability goals at minimum cost. The quality of indenture and essentiality data in the modeling programs is crucial to optimization models. Also, optimization models make the collection of accurate supply response time data particularly important. |

## B.2 Wholesale Inventory Management.

At the wholesale level, IMs support a specific weapons system or commodity. That support must be provided on a continual basis. Again, performance measurement is one key to success in this area, in that trends must be identified and evaluated for the sake of informed decision-making. Wholesale managers need on-line access to applicable logistics data including vendor production and delivery schedules, wholesale and retail stock levels, and turn-around times for reparables. They also need periodic updates on training and exercise plans, and retail-level performance indicators if they are to be held accountable for effective inventory management. Support objectives must be continually measured against current performance levels so that appropriate management decisions can be made. In addition to current MILSTEP performance indicators, wholesale-level disposal management indicators should be developed and implemented. This should include analysis of performance related to R&M objectives worldwide.

*MODELS Requirement:* The MODELS concept design should make it easy to measure the performance of a range of operations and trend indicators at the wholesale operations level.

B.3 Pipeline Performance.

Pipeline performance measurement is analyzed by logistics managers at all levels. The MODELS redesign needs to recognize the need to measure pipeline time on all supply requisitions (worldwide) from the time of (customer) request to the time of receipt takeup by the customer. Customers must include both replenishment stock supply offices, maintenance and repair depots, and base/unit supply or maintenance offices. Pipeline times will be measured against the UMMIPS standards.

These pipeline times should be measurable incrementally to define interval pipeline times to include as a minimum (1) time from submission of requisition transaction to receipt of requisition transaction at source of supply; (2) time for ICP supply processing and depot processing; (3) shipping time in transit from the storage point to the requisitioner (for overseas shipments this time includes time to port of embarkation, time to port of debarkation, and time from port of debarkation to requisitioner); (4) time spent in the contracting process; (5) time in transit from the vendor to the depot or other storage point; (6) time in-transit from the vendor to the customer when the vendor is tasked to ship directly; (7) time in transit for lateral support redistribution transfers; and (8) time in processing from the receipt dock to the receipt takeup by the customer (or until the materiel is stowed for stock replenishment). Additional segment measurements should be included, as appropriate (reference U.S. Army Direct Supply Support/Air Line of Communication [DSS/ALOC] standards).

Performance measurement of individual interval pipeline times is necessary to maintain visibility and control for management evaluation of each leg of transit so that appropriate actions and management decisions are applied toward the correct

transit factor. Pipeline data should be available through common, easy-to-use, on-line, menu-driven processing facilities with access to the data restricted only by the data owner's need for security on specified information.

> *MODELS Requirement:* The MODELS concept should identify methods and procedures to collect pipeline performance measurement data at each segment of the process as it occurs. The DLSS should standardize the definition of each pipeline segment.

An important component of the pipeline process is the identification of various types of supply, transportation, and product-quality discrepancies. In consolidating all logistics-related discrepancy procedures as recommended in Part I, Section D.2.i the DLSS should also incorporate performance evaluation of the discrepancy process in performance measurement procedures.

Performance evaluation of the discrepancy process should record, summarize, and report discrepancy information to enable management attention to be directed toward widespread conditions or DoD trends. This procedure would permit thorough, selective research to be effectively performed to identify the cause of serious, widespread error(s) and cooperative, corrective actions could be taken at an earlier time.

> *MODELS Requirement:* The MODELS concept must have the capability to electronically collect, collate, and summarize discrepancy reports from all S/A organizations worldwide as one element of performance measurement reporting. These discrepancy reporting evaluation procedures should be incorporated into DoD-wide standard performance measures.

B.4 Contracting.

Contract management requires measurement of performance within DoD contracting offices and of various vendor performance characteristics. Contracting is performed at several organizational levels, from local purchase of small items to Service procurement of weapons systems. Measurements are made for the levels of

competition in contracting. For all acquisitions, especially major systems, DoD contract managers must be able to evaluate contractor performance with respect to delivery milestones and expenditure targets. This level of performance measurement may require on-line interface with the contractor's management information system data bases. Contracting performance measurement must be available to PCOs and ACOs throughout DoD. Performance measurement criteria, although standardized, should have enough flexibility to meet changing management information needs and to accommodate differing requirements at the organizational level.

The process of procurement and contracting should be monitored by measuring, at a minimum:

- Procurement administrative leadtime
- Production leadtime
- Breakout (procurement of spares from the actual manufacturer vice the prime contractor for the weapons system)
- Competition
- Number of contracts in place by type (requirements, multiyear, and unpriced orders).

These measures should be quantified in terms of both numbers and value of transactions. In addition, management information is needed on "pricing" programs. That information should include the number and value of pricing reviews, challenges, and results of challenges. Those measurement criteria should be incorporated into a single logistics functions performance measurement procedures manual and cross-referenced in the appropriate modernized DLSS functional procedures manual.

*MODELS Requirement:* The DLSS should develop standard criteria for measuring procurement and contracting performance. The MODELS concept must include procedures to collect these standardized performance measurement data as a normal function of procurement and contract administration process information flows.

B.5 Interfund Billing.

Current billing procedures are archaic, inefficient, and very costly to manage. Every MILSTRIP shipment results in an Interfund Bill Detail Card that provides data that are redundant with data on many other MILSTRIP/MILSTRAP documents. These large volumes of billing transactions are communicated through AUTODIN and DAAS from the seller to the billing office. Images of these bills are stored in DAAS for 1 year to provide a data base for future recovery capability.

These bills are not paid until the buyer has verified the receipt of the materiel. One alternative to the use of an Interfund Bill Detail Card would be the use of the MILSTRAP Materiel Receipt Acknowledgment Document (MRAD) to electronically transfer funds from the buyer's to the seller's account. This action would eliminate the need for a separate billing transaction to accomplish the same action.

*MODELS Requirement:* The MODELS concept should include the development of methods toward modernizing the capability to accomplish the interfund billing procedures without the current cost.

B.6 Weapons System Management.

Inventory management in DoD is largely item- or commodity-oriented. Decisions are often made on an item or commodity basis without full consideration of the impact they have on the readiness of weapons systems. DoD has long sought to develop the capability to manage inventories of spare and repair parts on a weapons-system basis as a means of enhancing end-item readiness by focusing management attention and resources on those parts that directly affect the readiness of a weapons system.

In addition, weapons-system oriented inventory management improves S/A's ability to determine the funding required to achieve a prescribed readiness objective for a given weapons system and to project the effects of alternative funding levels on readiness. Therefore, information is available to justify budget submissions for spare and repair parts during departmental and Congressional reviews. In short, weapons system management provides the means for programming limited materiel investment funds more effectively to achieve a balanced posture of materiel readiness.

Measuring logistics operations performance against specific weapons system support goals represents a distinct improvement over measuring performance against average supply availability rates (i.e., measures of the percentage of customer demands that can be satisfied from stocks on hand). A high rate of supply availability does not necessarily equate to high readiness of a weapons system, because if one critical part is not available, the weapons system may not be able to fulfill its mission.

A logistics system oriented toward weapons system management objectives must measure logistics operations performance throughout the weapons system deployment and termination phases. Networking of all applicable logistics data bases is critical to satisfying weapons system support information requirements. Since performance measurement objectives are based on readiness goals specific to each weapons system, flexibility in the design of performance measurement criteria, data used, data query parameters, and data information sources is key to the success of a weapons system logistics support performance measurement program.

The Services and DLA must develop and maintain weapons system identifying data in their automated systems for secondary items identified as part of a weapons system. Weapons system files identifying item relationships will be used to establish the priority of need of one item to another and the degree of criticality of each

item relative to its next higher assembly and, ultimately, to the end-item or weapons system. ADP systems must be capable of using item relationship data in the requirements determination process.

Currently, S/A logistics data systems do not provide a complete linkage among secondary items, higher assemblies, and weapons systems. This linkage must be established, probably within catalog data files.

Establishment of weapons system item relationship files is a necessary step toward relating stockage decisions to the operational readiness of systems and will allow the most effective use of weapons system readiness optimization models. It will also allow the use of specific weapons system program data in the demand forecasting process.

Also by making possible the identification of every system or equipment that is dependent upon a secondary item, the establishment of complete application files will permit consideration of total requirements not only in computing buy/repair quantities but also in increasing the effectiveness of distribution decisions, allocation of management resources, disposal decisions, and such long-range management decisions as life-of-system buy determinations. Weapons system management and its implications for the logistics community are discussed further in Part II, Section C.1.

> *MODELS Requirement:* Modernized DLSS procedures must define a standard weapons system performance measurement program, including standardized weapons system identification codes in all applicable transactions. The DLSS procedures must allow for multiple weapons system coding for common-use items. The MODELS design must provide the automated capabilities to perform weapons system-oriented performance measurement of logistics operations. This must include access by weapons system relationships to wholesale and retail operational performance measurement data.

In conclusion, DoD-standard performance measurement of logistics operations are now very limited. The only consolidated set of procedures is that published in

MILSTEP and measured against UMMIPS standards. A comprehensive set of performance measurement criteria to address all logistics functions, including weapons system defined operations, is needed. A substantial effort in this regard has already been completed by the Spares Program Management Directorate within Logistics and Materiel Management (L&MM) in the Office of the Secretary of Defense (OSD). However, baseline measurement standards must still be developed for many of the criteria, and implementing procedures must be developed.

> *MODELS Requirement:* A comprehensive set of logistics operations performance measurements should be developed and implemented through a DLSS procedural publication.

# CHAPTER C. ACQUISITION FUNCTIONAL REQUIREMENTS

In the WBS, the Acquisition function is subdivided into three functional areas: Primary Item Acquisition, Secondary Item Acquisition, and Technical Data Acquisition. Only Secondary Item Acquisition is within the scope of this initial review of MODELS requirements. The other two functional areas should be considered for inclusion in MODELS in the future. Figure C-4 shows the WBS functions for Acquisition, and Table C-4 describes those functions.

The Secondary Acquisition process is decomposed into its two major functional activities, Procurement and Contract Administration. Those activities and their DLSS/MODELS relationships are discussed below.

## C.1 Procurement Activities.

Procurements are driven by weapons system, facility, and other materiel resource requirements. Requests for procurement generally flow from the IM at the wholesale level and vary in quantity from one to thousands. The PCO combines total requirements for each commodity and processes each purchase in accordance with the FAR and DFARS. The PCO determines the most feasible procurement action. Those actions include sealed bidding, negotiation procedures, small purchases, and imprest fund.

Normally, the IM asks the PCO to execute the procurement in specified quantities for delivery by specified dates. The PCO is charged with the responsibilities for soliciting offers, negotiating contracts, awarding contracts, and terminating contracts.

Accurate, timely information is essential to the efficient processing of procurement actions. In today's automated environment, many procurements can be and are initiated automatically. Procurements of this type are dependent on the availability of automated listings of prior bidders and their previous prices,

FIGURE C-4. SECONDARY ITEM ACQUISITION FUNCTIONS

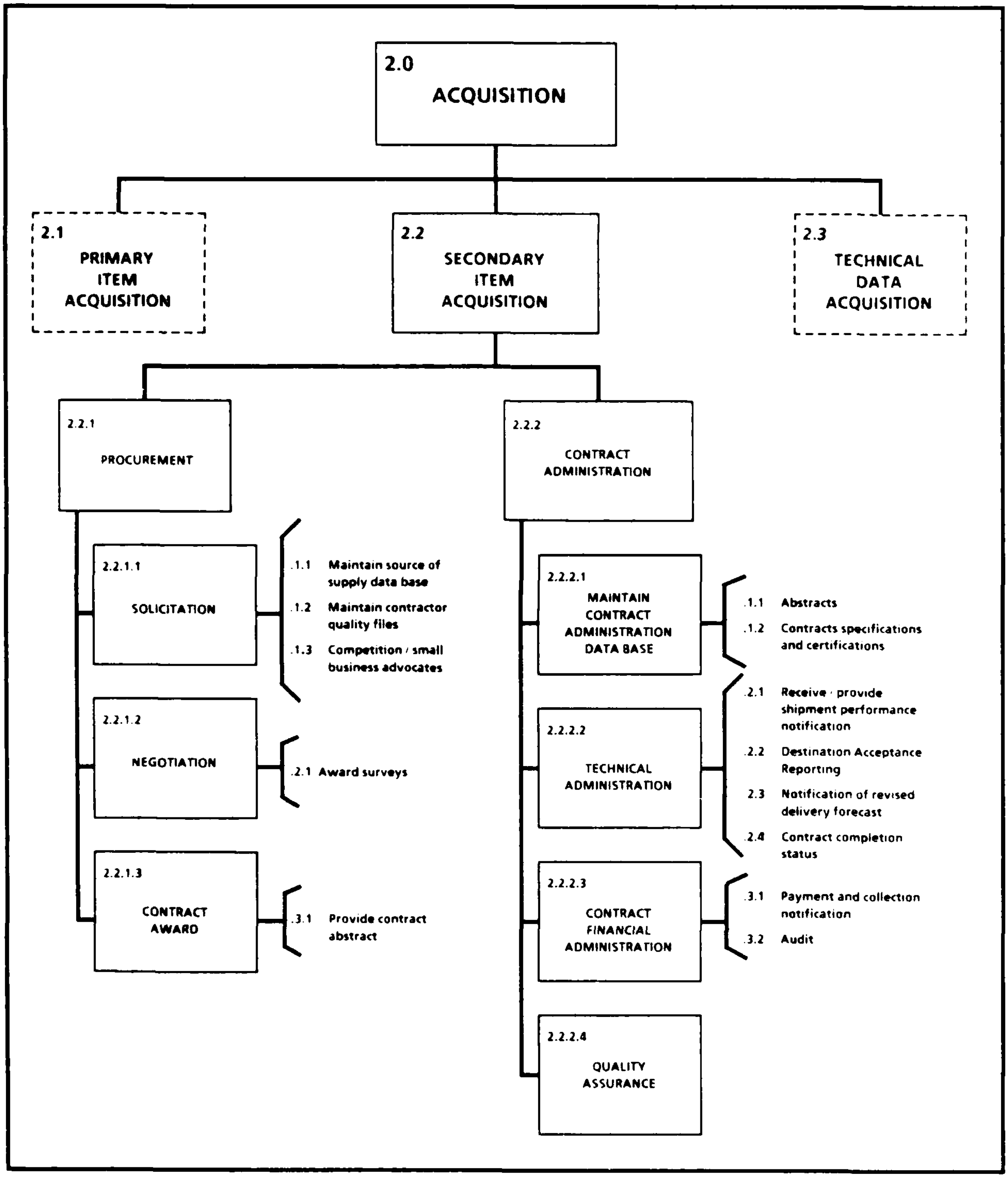


**TABLE C-4. DESCRIPTIONS: ACQUISITION FUNCTIONS**

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 2.0 Acquisition | The process of obtaining supplies or services by contract through purchase or lease, regardless of whether the quantities to be acquired are already in being or must be created, developed, or demonstrated and evaluated. Acquisition begins when requirements are established and functional specifications are documented. It includes selection of sources, solicitation, award of contract, funding, performance monitoring, contract administration, and technical and management functions that are directly related to satisfying requirements by contract. This includes preparation of technical data specifications for materiel contracts. |
| 2.1 Primary Item Acquisition | Acquisition of primary items is concerned with end items and replacement assemblies of such major importance that detailed analysis and review are required of all factors affecting their supply and demand. Primary items are normally designated on the basis of essentiality for combat or training, high financial value, difficulty of procurement or production, or criticality of basic materiels or components. |
| 2.2 Secondary Item Acquisition | The process of obtaining equipment and supplies not identified as a primary item. Secondary items include reparable components, subsystems and assemblies, consumable repair parts, bulk items and material, and expendable minor end items. |
| 2.2.1 Procurement | The process of obtaining personnel, services, supplies, and equipment from the private sector through purchase order, contract, or other obligating documents |
| 2.2.1.1 Solicitation | Policies, procedures, and practices are established requiring the Government to acquire goods, services, and facilities of the requisite quality and within the time needed at the lowest reasonable cost using competitive bidding to the maximum extent possible. This formulation takes into account the fact that present procurement laws require consideration of not only cost but other factors, such as quality and urgency, in the award of procurement contracts. Effective formal advertising relies wholly upon competitive pressure for reasonable prices |
| 2.2.1.2 Negotiation | Negotiation means contracting through the use of either competitive or other-than-competitive proposals and discussions. Any contract awarded without using sealed bidding procedures is a negotiated contract. Negotiation is a procedure that includes the receipt of proposals from offerors, permits bargaining, and usually affords offerors an opportunity to revise their offers before award of a contract. Bargaining – in the sense of discussion, persuasion, alteration of initial assumptions and positions, and give-and-take – may apply to price, schedule, technical requirements, type of contract, and other terms of a proposed contract |
| 2.2.1.3 Contract Award | The award of a contractual obligation for services, equipment, or supplies to a commercial vendor. Usually a formal document is signed by the Government and the contractor's official representative for a specified quantity to be delivered at a specific location by a certain date |

## TABLE C-4. DESCRIPTIONS: ACQUISITION FUNCTIONS (CONTINUED)

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 2.2.2 Contract Administration | Contract administration comprises all the actions that the Government must take with respect to the contractor until the material or service has been delivered, accepted, and paid for, and the contract closed out. These actions range from production surveillance through inspection, quality assurance, and expediting on the one hand, and allowance of costs, change-order pricing, termination settlements, property management, and payment on the other. The five major categories of functions performed include: (1) provision of broad supporting services to the procuring agency, (2) enforcement of contract provisions, (3) control of performance costs and product quality; (4) performance of liaison and coordination services between contractor and procuring agency, and (5) collection and evaluation of data relating to contractor performance. Management during the performance phase of a contract is the primary responsibility of the contract administration office. |
| 2.2.2.1 Maintain Contract Administration Data Base | The process of maintaining a comprehensive data base of contracts and contract data. The data base should include standard clauses and data elements necessary to the administration and, when applicable, payment of the contract. It should contain all related contract performance measurement and qualitative remarks. The data base should be capable of accepting and issuing applicable MILSCAP transactions. |
| 2.2.2.2 Technical Administration | Among the continuing functions of contract administration, the most important are surveillance of the contractor's progress toward completion and maintenance of a constant flow of information to the procuring activity on the status of contracts. In most contracts where progress information is necessary, the two factors of primary interest are actual progress toward completing the work and financial status of the contract. The extent and degree of monitoring required on a particular contract depend on the size, complexity, and urgency of the project. |
| 2.2.2.3 Contract Financial Administration | A major instrument for protecting the Government's interest is its contract auditing organization. Contract audits are carried out primarily to (1) aid in pricing, and (2) review and recommend to ACOs the action they should take on vouchers submitted for reimbursement under cost-type contracts. Contract audit reports are normally required on all proposed negotiated procurements of more than $100,000. The audit report is submitted to the ACO who consolidates and evaluates the findings of the pricing team for submittal to the procuring officer. |
| 2.2.2.4 Quality Assurance | Quality assurance means monitoring product quality during production, upon acceptance, and in use to prevent or detect defects or nonconforming conditions that would limit the ability of the product to fulfill its purpose. Where the item being bought is commercial, uncomplicated, and not critical, total reliance is often placed on the contractor's internal quality control program. In contracts for complex, critical military items on the other hand, the contractor may be required to establish and maintain a program that meets detailed Government specifications. |
| 2.3 Technical Data Acquisition | The activities relating to the policies and procedures used to obtain needed technical data for maintenance and repair, spare parts procurement, and inventory management. For major end items the technical data are usually acquired from the R&D contractor as one product in the total set of contractual deliverables. |

performance characteristics, order and contract characteristics (minimum order quantities, economic order quantities, etc.), average leadtime information, and similar procurement-type data. From the Government's viewpoint, the automated system needs minimum and maximum order quantity, demand projections, acceptable substitutes, required delivery dates (RDDs), delivery locations, and similar contractual terms and conditions to stimulate competition and complete negotiations.

Large procurements are conducted manually. Most procurements of $10,000 or more are announced in the Commerce Business Daily. Government specifications and requirements are described in formal solicitations (sealed bidding and/or contracting by negotiations). A comprehensive evaluation, with subsequent requests/responses for clarification, when applicable, precede the final contract award. This process is often a lengthy one, taking from 6 months to as long as 36 months in extreme cases for major end-items requiring an operational demonstration as part of the final negotiation process.

> *MODELS Requirement:* The modernized DLSS procedures should encompass standard procurement functions, contract modifications, and related inter-S/A information exchange requirements.

C.2 Contract Administration Activities.

Upon award of the procurement, a contract is issued; it must be administered through completion, either delivery of the commodity, performance of the service, or termination of the contract. The PCO either administers the contract with his/her own resources or passes responsibility for administration to an ACO. Contract data is critical to effective performance of contract activities and functions. Each PCO, ACO, and contractor maintains some form of contract management data base. Contracting data should be available in an on-line data base in a form to facilitate

variable queries. The ACO/PCO information needed in this data base includes:

- Contract and contract modification information
- Pertinent Quality Deficiency Reports (QDRs) and Reports of Discrepancy (RODs) data, to be used for management review during contract administration
- Shipment information
- Revised delivery information
- Contractor invoice and payment information
- Audit trails of all transactions
- Contract historical files.

During administration, the ACO informs the PCO routinely about the status of the contract. The ACO is charged with responsibility for (1) maintaining contract administration data; (2) carrying out such technical administration functions as receiving and transmitting shipment performance information, destination acceptance information, revised delivery forecast information, and contract completion status reports; (3) ensuring that Defense Contract Administration Service Region (DCASR) conducts contract financial administration; (4) performing quality assurance reviews; and (5) facilitating DoD-to-vendor data interchange.

C.2.a MILSCAP Transactions.

MILSCAP transactions are currently used to a very limited extent to transmit the standard contract data elements required for standard contract procurement and administration procedures. Today's transactions are fixed in length and transmit a minimum amount of pertinent data.

*MODELS Requirement:* MODELS acquisition function transaction formats must be variable in length to accommodate all S/A contract data exchange requirements. All procurement and contract-related information should be available electronically.

C.2.b Maintain Contract Administration Data Base.

Contract data from the PCO are maintained in the ACO's data base for contract administration. Contract abstract data establish the contract administration data base, which must be designed to help the ACO manage the following:

- Master contract file records
- Receipt of contract major event status
- Property administration
- Quality assurance
- Production
- Transportation
- Management statistics.

DoD and its contractors should, when practical, have on-line capability for a designated level of direct interface with each other's contract data bases. This interface should include a limited-access query capability into the vendor's management data bases and vice versa. Access to those data bases will, in all cases, be as determined by agreement with the contractor. The scope of data base access will be limited through software security controls.

C.2.c Technical Administration.

Technical administration is the heart of the contract transaction environment; in other words, most of the data exchanged between S/As will stem from the technical administration function. These transactions include, but are not limited to, four basic families: (1) shipment performance notices (SPNs), (2) destination acceptance reports (DARs), (3) revised delivery forecasts (RDFs), and (4) contract

completion status. The SPN, the means of providing timely notification of shipment of materiel or completion of a service by a contractor, should provide information for updating asset requirement status, pipeline status, MILSTRIP status, and customer billing and payment. The DAR should serve to notify the paying office that the customer has accepted the materiel and the contractor should be paid. Destination acceptance should also serve to notify payment offices to post customer financial accounts accordingly. The RDF should notify applicable PCO activities about anticipated or actual deviations from the original contract delivery schedule. It should provide a new forecast delivery date and the reason for revising the original date. The contract completion status allows for reporting of:

- Status of closed contracts when performance has been completed
- Major events leading to the closing of contract files
- Unclosed contract statements when DFARS contract close-out dates are not met
- Final notification of contract close-out.

With respect to these four families of transactions – SPN, DAR, RDF, and reports of contract completion – data must flow freely among all potential users. Contract administration status affects management decisions directly in supply, transportation, and maintenance. The data should be available by part number and national stock number (NSN) to provide a broad view of materiel on order.

> *MODELS Requirement:* The MODELS concept must provide access to contract data via various data elements and also establish and maintain relationships among data elements through a well-designed data architecture.

C.2.d Contract Financial Administration.

This function entails preparation of detailed payment or collection data. The data should then be transmitted automatically to the appropriate finance office for posting to the applicable contractors. As accounts are paid, the customer's

accountable activities are automatically notified. That notification includes identification of any payment variances from amount originally committed to the customer.

C.2.e Quality Assurance.

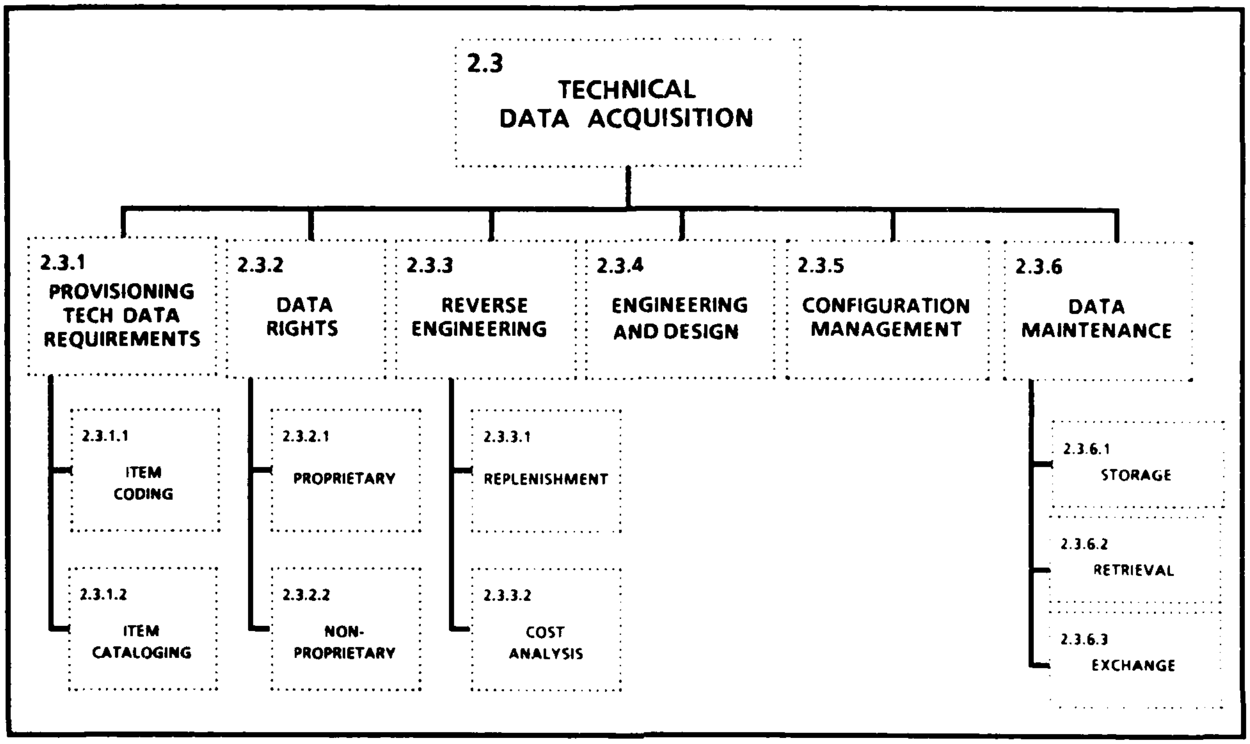
Quality assurance parameters must be identified, documented, and measured. As a result of continued quality evaluations, contractor deficiency reports (CDRs) are prepared and presented to the contractor for resolution.

> *MODELS Requirement:* CDRs should become a part of ACO/PCO data bases and should be available on-line.

C.3 Technical Data Acquisition.

Technical data acquisition is becoming increasingly important as a major function of the procurement process. It is critical to effective maintenance of weapons systems at all levels and fosters increased competition after initial provisioning. Although acquisition of technical data is not addressed in current MODELS design efforts, the MODELS project recognizes its importance and the need for eventual inclusion in DLSS procedures. OSD is now sponsoring an extensive project to address technical data acquisition and automation. The MODELS team is maintaining a continuing awareness of developments and recommendations of the Computer-Aided Logistics Support (CALS) OSD project. CALS recommendations, policies, procedures, and information exchange protocols will be incorporated into MODELS efforts as they are documented and approved. Standard information communication transactions, including the ability to transmit drawings and photographs, will be required in future stages of the MODELS implementation. A proposed MODELS functional area coverage for future consideration is provided in Figure C-5.

FIGURE C-5. TECHNICAL DATA ACQUISITION FUNCTIONS




*MODELS Requirement:* The MODELS effort should continue to closely monitor CALS developments and information exchange protocols and procedures. As standards are developed by the OSD-CALS Group for technical data acquisition and distribution procedures and communications interfaces, these standards should be published as part of the modernized DLSS technical data functions discussed here and in Part I, Section D.3.

As previously described in Table C-4, technical data acquisition encompasses the activities related to the policies and procedures used to acquire needed technical data for maintenance, spare parts replenishment procurement, and inventory management. Most technical data for major end items are acquired from the R&D contractor during the initial provisioning process. All parts designated for the initial allowance list are coded with a vendor-unique part number and assigned an NSN by the Defense Integrated Data System (DIDS).

During this initial provisioning process, issues of data rights must be carefully reviewed and evaluated to ensure future competition in the procurement of replenishment spare parts. Data rights involve the determination by the Government of who rightfully owns the data. Parts designed and developed by the contractor with company independent R&D funds are designated as contractor-owned, and associated technical data may be distinguished by proprietary data markings. Parts developed with government funds or available from other commercial sources are open stock, and technical data are, therefore, nonproprietary.

Replenishment spare parts for which technical data are inadequate or marked proprietary are often subjected to reverse engineering. That function is the set of activities relating to the application of engineering techniques to existing spare parts to determine a more cost-effective design/production methodology and to develop adequate technical data specifications that will make competitive procurement more likely.

Engineering and design activities include the evaluation and analysis of spare parts to determine the level of technical data requirements. Because major end items are constantly being changed and improved as they are used in operational environments, configuration management of technical data is a critical factor in both maintenance and supply operations.

Configuration management is the set of activities relating to the effective management of systems configuration data. For the maintenance engineer such technical data are vital to ensure that correct parts are used in repair or replacement. To the supply officer, the data are vital to ensure that correct parts are ordered and in stock for maintenance. As parts change over time, timely configuration management change notices allow supply operations to identify parts for excessing at the earliest possible time.

The final function addressed in Figure C-5 is technical data maintenance. It includes activities related to development and execution of policies, systems, and procedures for the storage, retrieval, and exchange of technical data between S/As responsible for maintenance and operation of the end item or support equipment.

# CHAPTER D. SUPPLY FUNCTIONAL REQUIREMENTS

The major functions of supply, as illustrated in the WBS shown in Figure D-6, encompass:

- Retail operations
- Wholesale inventory management
- Technical data management
- Wholesale storage.

Most DLSS functional requirements, both existing and proposed, fall into the supply operations area. The current DLSS encompass wholesale inventory management, wholesale storage, retail requisitioning, and wholesale requisition processing. The integrated MODELS approach envisions more complete coverage of these areas, with additional functions added to the DLSS concept. Each of the third-tier WBS supply functions is discussed in detail below.

## D.1 Retail Requisitioning.

Most S/A retail-level systems are based on or parallel the existing DLSS. The scope of proposed DLSS coverage, within the MODELS framework, for retail requisitioning is shown in Figure D-7. Retail operations WBS functions are described in Table D-5. Under the MODELS concept, retail transactions using variable-field/ variable-length transaction formats could easily cross S/A lines. Intermediate retail supply centers [e.g., Naval Supply Centers (NSCs)] and base/unit-level direct-user issue-supply facilities could use common elements for local issue and internal processing.

A data base management system (DBMS) data architecture based on a standard data model would allow local variations and unique data elements to be superimposed on the DLSS superstructure. This type of operation would preserve the

FIGURE D-6. SUPPLY FUNCTIONS

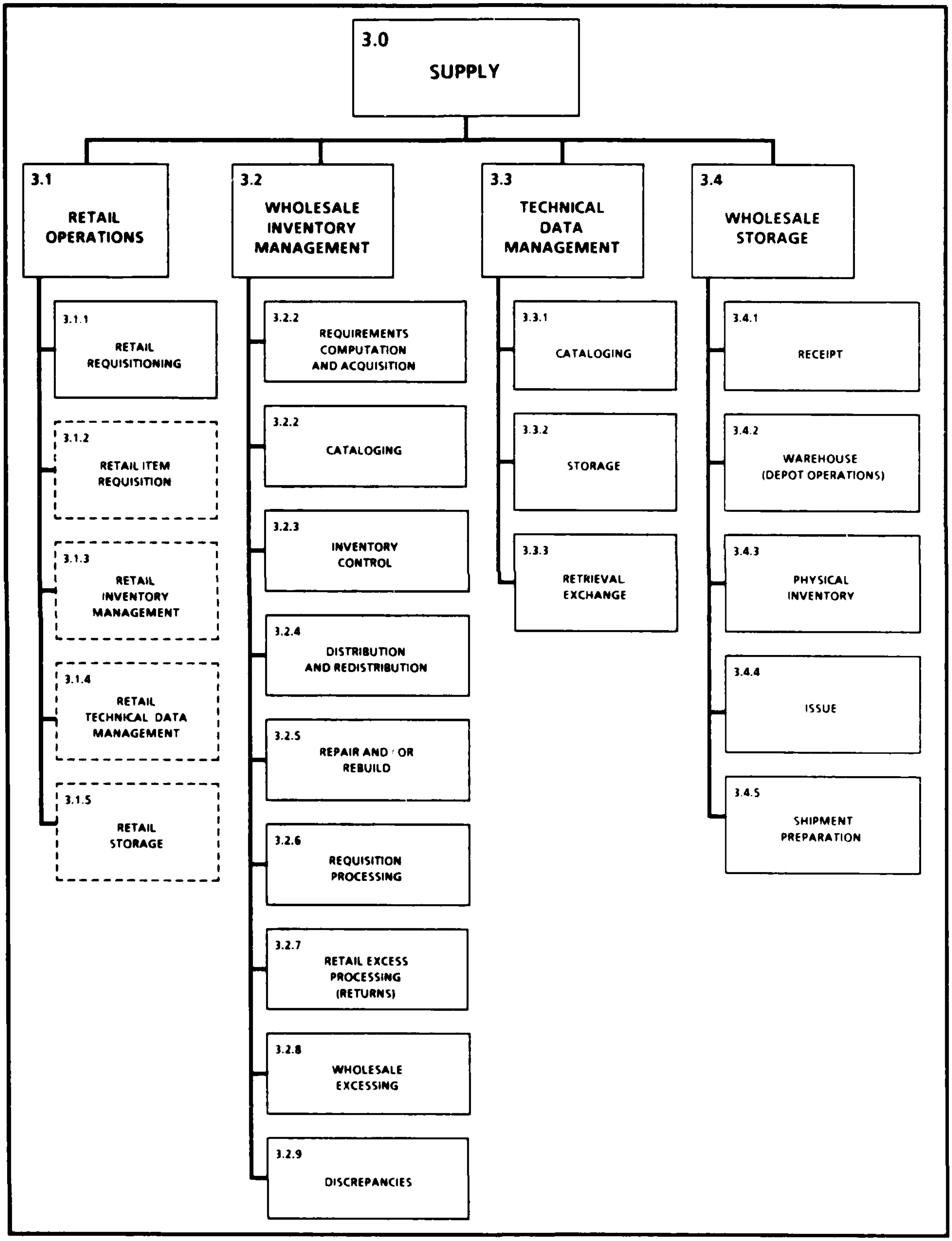
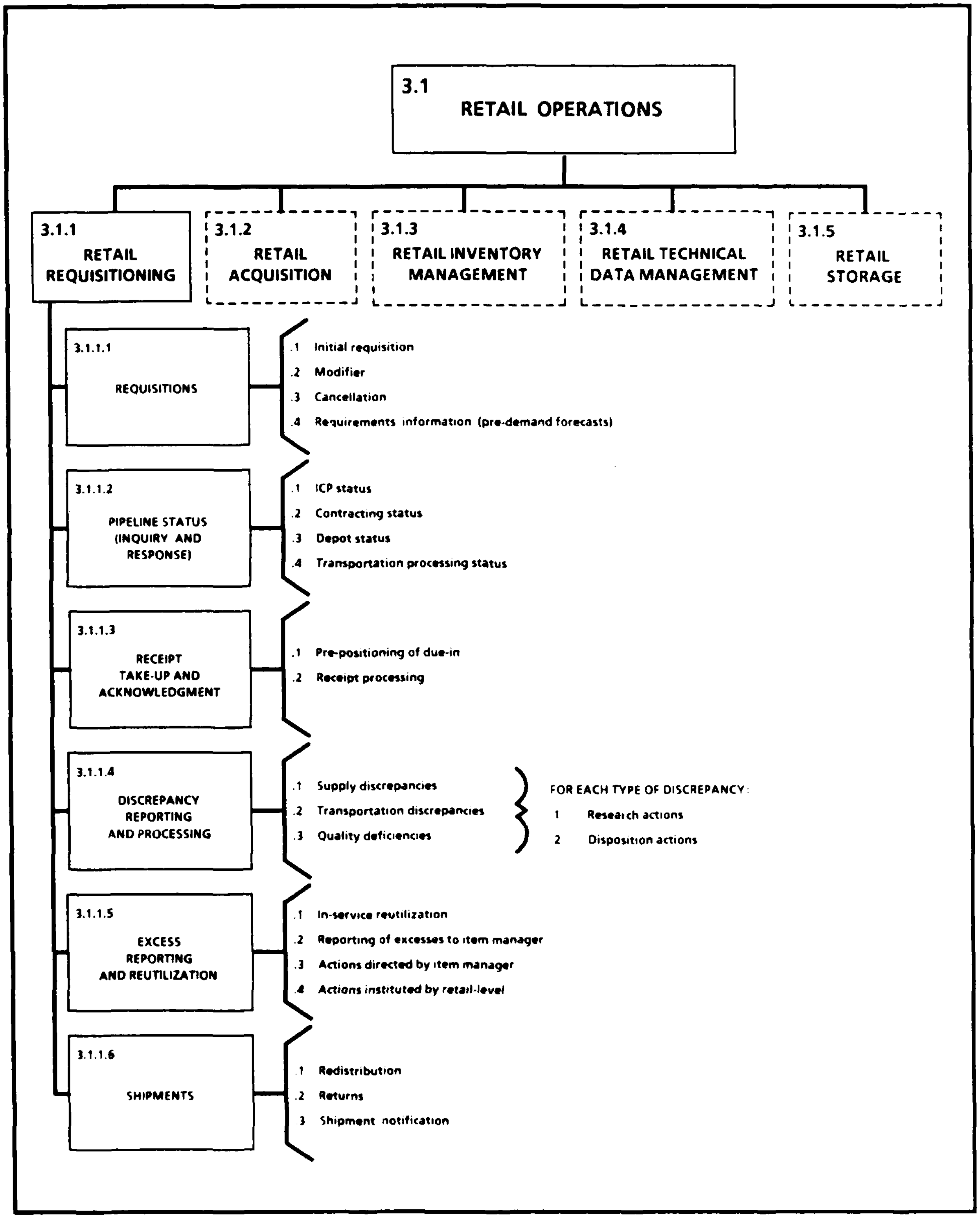


**FIGURE D-7. SUPPLY: RETAIL OPERATIONS FUNCTIONS**



## TABLE D-5. DESCRIPTIONS: SUPPLY/RETAIL OPERATIONS FUNCTIONS

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 3.0 Supply | The function of supply is to provide end items, equipment, and repair and replacement parts to operational and support units on an as-requested basis. The supply process begins with a request for equipment or materiel, usually by a retail-level unit using a requisition document. If the requested item(s) is not available at the retail unit, the requisition is processed through the supply system to the wholesale inventory management function. During the requisitioning process, technical data may be required for initial item(s) identification or subsequent determination of acceptable substitutes. If the item(s) are physically available in the DoD supply system, the appropriate wholesale storage facility is requested to process the item(s) for shipment to the requisitioner. Thus, the supply function includes: (1) retail operations, (2) wholesale inventory management, (3) technical data management, and (4) wholesale storage as major subfunctions for this MODELS analysis. |
| 3.1 Retail Operations | The supply operations of retail-level installations have two bases: nondemand based stocks required to ensure materiel readiness of supported units and stockage criteria based on demand and/or item essentiality. Exceptions are made for stocks relating to certain medical and mission supplies and for supplies authorized by official authorization documents. The ability of retail-level customers to operate effectively is directly related to the responsiveness of the wholesale-level supply activities. |
| 3.1.1 Retail Requisitioning | Stockage of supplies at retail-level installations is based primarily upon demand or, if approved as mission essential, for war reserve. Requisitioning objectives depend upon demand and upon the leadtime required to place goods on the shelves. |
| 3.1.1.1 Requisitions | Four types of procedures are associated with submission of a request for equipment or materiel: (1) the requisition is the basic request from the retail (or user) level to the wholesale level; (2) the requisition can be modified after it is submitted to the wholesale source through a "modifier"; (3) To cancel the entire initial requisition, a cancellation notice is issued; and (4) a requirements *information notice* is used to notify the wholesale source of forthcoming/projected retail-level requirements. |
| 3.1.1.2 Pipeline Status (Inquiry and Response) | The requisition status is provided to the retail requisitioner from the wholesale source of supply or the depot as appropriate. When a requisition is being satisfied directly from vendor procurement, the contract administrator is responsible for regularly notifying the item manager who passes the information along to the requisitioner(s). The retail-level requisitioner is also notified of transportation shipment actions. |
| 3.1.1.3 Receipt Take-Up and Acknowledgment | Pre-positioning of due-in is the process by which the requisition due-in status is posted to the requisition record within the requisition data base. The retail level notifies the wholesale level that it has received the requisitioned property. The receipt acknowledgment process is crucial to accurate pipeline measurement. |
| 3.1.1.4 Report of Discrepancy | Three basic types of discrepancies are reported within military logistics retail operations from the retail level to the wholesale level: (1) supply-type discrepancies, (2) transportation discrepancies, and (3) quality deficiencies. |
| 3.1.1.5 Excessing | The general procedure is that the retail level notifies the IM at the wholesale level that property is available at the retail level for disposition. The IM responds by directing disposition of the property. Retail-level actions are taken in response to these property disposition instructions. Retail-level actions are also taken on the basis of retail-level decisions for property not managed by the wholesale level. The property is made available in accordance with applicable DoD Instructions. |
| 3.1.1.6 Shipments | Retail level shipments include redistribution and materiel returns. Redistribution is the process by which property is shipped to an authorized user as determined by wholesale inventory management. Property shipped from the retail level to the wholesale level, as directed by the wholesale inventory management, is categorized as a return. By shipment notification, the consignor informs the receiver that the shipment has been made; for redistributions and returns, the ICP would also be notified. |

document control number from the end-user to the wholesale source and would standardize the initial requisition date for control and meaningful comparison of performance (i.e., the date the demand-user generates the requisition, rather than the date the supply center generates the demand-requisition, because the latter date varies among S/As).

A standard DLSS document identification and control number is essential, but incorporating S/A supplemental controls into a variable-field requisition would be feasible.

D.1.a Requisitions.

Under the MODELS concept, the requisitioner at intermediate retail levels [i.e., NSCs or Air Force base supply] should be allowed direct access via remote terminal to wholesale-source R&M data bases for inquiries and asset status. That access is now available to a limited set of retail users connected to the Defense Logistics Agency Telecommunications Network, (DLANET). However, inter-S/A standards for both access and inquiry functions to all ICPs should be standardized for retail users. Interactive inquiry could also reduce the need for massive, redundant, Service-maintained logistics data files and could reduce the requirement for broadcasting routine status. The latter issue is discussed in more detail in Part II, Section B.3.

Standardization of requisitioning procedures and transactions at retail levels is needed to promote intra- and inter-Service redistribution of both critical and excess assets. Enhanced retail interfaces with other logistics components will lead to increased visibility of retail assets, promoting redistribution of excess materiel and encouraging the sharing of scarce items.

Retail-users, whether supply or maintenance managers, should be able to initiate requisitions and related transactions, using on-line, full-screen displays with local editing. This use should include such follow-up actions as modifiers and

cancellations. This interactive capability should also provide supply sources with requirements and demand information. MILSTRIP and MILSTRAP are prescribed but not implemented uniformly at the retail-user level.

End-user interfaces must be designed to ease access to the supply system by maintenance personnel, configuration control personnel, and weapons system operations planners, as well as retail supply personnel. The MODELS concept should review the feasibility of permitting direct access to all S/A wholesale suppliers, especially DLA and GSA. Considerations for direct-access, interactive capability should include monitoring of high-priority, not-mission-capable-supply requirements, and more accurate and timely notice of the effects on weapons systems.

A critical need exists for supply retail systems to develop an effective retail-wholesale interface to relate retail issues to replenishment demands on the wholesale system. Development of this concept requires some standardization in the design of retail/intermediate-level data bases to support end-user requisition control files. The wholesale system could then be restructured to separate retail issue and stock replenishment demand processing, thereby providing a better level of supply support for retail demand requisitions.

> *MODELS Requirement:* Retail requisitioning should be DLSS compatible throughout the S/A logistics community. DLSS procedures should standardize the requisitioning transaction to accommodate retail-level end-user requirements.

D.1.b Pipeline Status – Inquiry and Response.

The requisition status is provided to the retail requisitioner from the wholesale source of supply or the depot, as appropriate. When a requisition is being satisfied directly from vendor procurement, the contract administrator is responsible for regularly notifying the item manager of its status, and he/she should pass the updated and/or revised information along to the requisitioner(s). The retail-level requisitioner is also notified of each transportation shipment action. MODELS must

provide customers and command elements with the capability to track requirements and materiel through the logistics pipeline. This inquiry capability should include:

- Supply source status
- Vendor status
- Depot status – hold, denial, shipment
- Transportation processing status – reason for delay, shipping information.

> *<u>MODELS Requirement</u>:* The MODELS concept should provide retail users with direct, on-line access to retail supply echelons within their supply issue hierarchy and then to the wholesale logistics systems for inquiries about stock availability, identification of retail-issue requisition demand and shipment action.

D.1.c <u>Receipt Take-Up and Acknowledgment</u>.

Pre-positioning of due-ins is the process by which due-in status of the requisition is communicated to the requisitioner. The retail level in turn notifies the wholesale level when it has received the requisitioned item. This receipt acknowledgment process is crucial to accurate pipeline measurements. The DLSS functional modernization should incorporate standard procedures for retail receipt take-up and acknowledgment in a closed-loop system, to improve the accountability and traceability of materiel. This process is now being considered under the umbrella of the Materiel Receipt Acknowledgment and Supply Discrepancy Reporting System (MRASDRS). Standardized implementation of these procedures would encourage reliance on retail requisition records to establish due-ins.

> *<u>MODELS Requirement</u>:* The MODELS concept must recognize the usefulness of bar coding for the receipt take-up and acknowledgment process and must include DLSS procedures for accessing due-in posted data, using bar-coding techniques, with automated receipt posting and reporting.

D.1.d Discrepancy Reporting and Processing.

The three basic types of discrepancies that are reported from the retail level to the wholesale level are supply-type discrepancies, transportation discrepancies, and quality deficiencies. Automated retail discrepancy reporting, with a tie-in to receipt processing, would provide a closed-loop system and materiel accountability, incorporating the MRASDRS concept. DLSS standard procedures for discrepancy reporting should not be limited to supply discrepancies; rather, they should be an integrated system that also includes transportation discrepancies and quality deficiencies.

> *MODELS Requirement:* The MODELS implementation should encourage automating all types of discrepancy/deficiency recordkeeping and propose procedures for automated response and disposition instruction processing, in accordance with integrated standards published in modernized DLSS procedures.

D.1.e Excess Reporting and Reutilization.

Customers may report excess materiel to either the retail or wholesale support activity. In the DRMS, rapid, accurate identification and materiel accountability are major concerns. On-line, interactive capability for DRMS functions should dramatically improve:

- In-service reutilization
- Reporting to item managers
- IM-directed disposition actions
- Retail- or user-level disposition.

Development of an on-line network for improving R&M functions is already underway through development of the Defense Reutilization and Marketing Service Automated Information System (DAISY). The DAISY capability should be interfaced into the MODELS system concept design.

*MODELS Requirement:* The modernized, expanded DLSS should standardize processing of materiel and equipment to DRMO's, including all types of local turn-ins. The automated processing of materiel to R&M functions, even for local turn-ins, should be interfaced with MODELS implementation.

D.1.f Shipments.

Several types of shipments occur at the retail level. Redistribution is the process by which property is shipped by the retail organization to another authorized user, as determined by wholesale inventory management. Property shipped from the retail level to the wholesale level, as directed by wholesale inventory management, is categorized as a return. By shipment notification, the consignor informs the receiver that the shipment has been made. The notification may also be sent to interested third parties. DLSS instructions need to incorporate information interchange procedures currently written in the MTMR and to utilize and develop standard data interfaces to commercial applications for Electronic Business Data Interchange (EBDI). Return and redistribution procedures – including redistribution documentation, returns documentation, and shipment notifications – also need to be standardized.

*MODELS Requirement:* Procedures for all retail shipment preparation and documentation should be incorporated into the modernized DLSS.

D.1.g Other Retail Operations Functions.

The remaining four functions displayed in dashed boxes in the retail operations WBS diagram (Figure D-7) should eventually be included in the DLSS for development and publication of standardized procedures. However, since a great many issues remain to be resolved in each of those areas, their incorporation should be postponed until higher-priority functional areas are implemented and fully accepted throughout the S/A logistics environment.

D.2 Wholesale Inventory Management.

The DLSS should encompass the full spectrum of information preparation and exchange requirements for wholesale inventory management functions illustrated in Figure D-8 and described in Table D-6.

D.2.a Requirements Computation and Acquisition.

Several DLSS procedures already provide some data for requirements computations [MILSTRIP reports demand codes; MILSTRAP specifies reporting of Logistics Assets Support Estimates (LASEs) and Special Program Requirements (SPRs)]. The MODELS concept should include standards for analysis of demand and presentation of requirements data.

The Services ensure that allowance computations for initial provisioning are consistent with the computations of replenishment requirements. Initial allowances must often be computed on the basis of engineering estimates since little or no historical data are available. As historical demand on the system is accumulated, requirement computations usually change. However, the magnitude of these changes is amplified if, in addition to the engineering estimates being supplanted by historical data, the provisioning and replenishment models employ different logic. This problem could be alleviated if provisioning and replenishment computations used the same model that was designed to accept either engineering estimates or historical demand. Program data are used extensively during computation of initial allowances. Those data should also be used by the inventory models to adjust requirements during the phase-out period of a weapons system.

## FIGURE D-8. SUPPLY: WHOLESALE INVENTORY MANAGEMENT FUNCTIONS

### 3.2 WHOLESALE INVENTORY MANAGEMENT

**3.2.1 REQUIREMENTS COMPUTATION AND ACQUISITION**

- .1 Inventory requirements
  - .1.1 Provisioning
  - .1.2 Wholesale requirements
  - .1.3 War materiel requirements
- .2 Identify requirements parameters
- .3 Determine quantitative amount by acquisition source (contract, excess, disposal, other wholesale unit)
- .4 Prepare procurement request
- .5 Requisition (stock repositioning)

**3.2.2 CATALOGING**

- .1 Item identification
  - .1.1 Item entry
  - .1.2 Item interchangeability
  - .1.3 Item reduction
- .2 Catalog management data collection and distribution
- .3 Documentation / publication
- .4 Logistical reassignments (catalog changes)

**3.2.3 INVENTORY CONTROL**

- .1 Issues
- .2 Replenishment
- .3 Due-in, pre-positioning
- .4 Receipts
- .5 Adjustments
  - .1 Purpose, ownership, condition
  - .2 Losses, gains
- .6 Demand accumulation
- .7 Re-identification (catalog changes)
- .8 Quality control (of receipts)
- .9 Logistical reassignments (negotiated)
- 10 Shelf life

**3.2.4 DISTRIBUTION AND REDISTRIBUTION**

- .1 Determine logistical support requirements
- .2 Stockage pattern
- .3 Stratification
- .4 Redistribution
  - 4.1 Wholesale
  - 4.2 Retail

Continued on next page

## FIGURE D-8. WHOLESALE INVENTORY MANAGEMENT FUNCTIONS (CONTINUED)

**3.2 WHOLESALE INVENTORY MANAGEMENT (Continued)**

**3.2.5 REPAIR AND/OR REBUILD**

- .1 Depot organic maintenance.
- .2 Contracted commercial maintenance
- .3 Exchange

**3.2.6 REQUISITION PROCESSING**

- .1 Requisition edits
  - .1.1 Data validation
  - .1.2 Prioritization
- .2 Source of supply determination
- .3 Method of supply determination
- .4 Materiel release processing
- .5 Status
- .6 Modifiers
- .7 Cancellations
- .8 Backorders
  - .8.1 Reconciliation
  - .8.2 Release
- .9 Accumulate demand

**3.2.7 RETAIL EXCESS PROCESSING (RETURNS)**

- .1 Retail excess reporting to ICPs
- .2 Disposition
  - .2.1 Take-up in wholesale stock
  - .2.2 Redistribution
  - .2.3 Local reutilization
- .3 Repairable return / exchange

**3.2.8 WHOLESALE EXCESSING**

- .1 ICP determination of wholesale excess
- .2 Disposal release (to disposing function)

**3.2.9 DISCREPANCIES**

- .1 Documentation
  - .1.1 Customer reporting
  - .1.2 Wholesale receipt discrepancies
- .2 Investigation
  - .2.1 Inspection
  - .2.2 Inventory
  - .2.3 Other causative research
- .3 Disposition
  - .3.1 Response
  - .3.2 Adjustments
    - .3.2.1 Credit
    - .3.2.2 Stock
  - 3.3 Materiel disposition

## TABLE D-6. DESCRIPTIONS: SUPPLY/WHOLESALE INVENTORY MANAGEMENT FUNCTIONS

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 3.2 Wholesale Inventory Management | The management and control of inventory under the direction of the ICP, which maintains quantities of stock to satisfy requisitions from the retail level. These are inventories, regardless of funding source, over which an IM at the national level has asset knowledge and exercises unrestricted asset control to meet worldwide inventory management responsibilities. |
| 3.2.1 Requirements Computation and Acquisition | Requirements computation is an on-going process performed to support and augment the wholesale inventory acquisition process. It is the computation, using various mathematical models, of the quantities of supplies and spare parts needed to meet the requisitioning demands of retail-level users. The first stage of requirements computation associated with major end items is initial provisioning and allowance lists. This process identifies the spare parts for repair/replacement to be delivered with the end item. As the end item is used operationally, a parts-demand history develops. Requirements computation is then based on the demand history trends integrated with other requirements information, such as program operational requirements, insurances requirements, etc. The actual spare parts acquisition process is further factored by economic order quantities (or annual buy quantities) to determine a best-buy amount for replenishment. As a major end item is phased-out of the active inventory, the requirements computation process should again be changed to utilize demand history factored and weighted by operational levels and phase-out estimates to reduce parts surplus as the use of the end item is terminated. Basic policy guidance for initial provisioning and for requirements computation for secondary items is provided in DoDD 4140.40 and 4140.42 respectively.<br>For commodities not directly associated with end items, the requirements computation is based on historical demand trends factored and weighted by economic order or annual buy quantities. |
| 3.2.2 Cataloging | Cataloging consists of naming, identifying, classifying, and numbering items of property. Responsibility for technical research and item identification rests with the ICPs in each S/A. It is basic policy of the Federal Catalog System that each item of supply will be described and classified in such a manner that it is identified by a single stock number. The system encompasses all items subject to stockage for supply system support or subject to repetitive procurement, distribution, and issue. |
| 3.2.3 Inventory Control | Inventory control includes maintenance of stock levels and replenishment of these levels so that (1) items are supplied to using organizations when and where they are needed; (2) overall investment in inventories is kept to a minimum, consistent with the need; and (3) the workload of supply transactions (including procurement actions and stock status and transaction reporting) is controlled, in both detail and frequency. |
| 3.2.4 Distribution and Redistribution | These are the logistics processes that cover positioning of materiel at specific storage points and movement of materiel between storage points (redistribution). Time, distance, and load factors of the defense distribution system play major roles in the successful deployment of military capability and determine, to a large extent, the size of the inventory and investment needed to maintain supplies in the hands of the U.S. fighting force. Distribution systems consist of a complex series of echelons of supply, which extend from the ICP through a depot system and subsidiary storage points to the ultimate consumer on the flight line, aboard the ship, or in the field. To be efficient, these systems must (1) be responsive to the customer, (2) have the ability to expand rapidly in times of national emergency, (3) be economical to operate, and (4) be resistant to disruption by overt or covert actions. |
| 3.2.5 Repair and/or Rebuild | Maintenance is a major contributor to defense operational readiness. Many items of equipment and subassemblies of end items are designed as repair or rebuild at different levels of field or depot maintenance. To support these maintenance functions, supply inventories must have spare parts available to meet maintenance demand. Thus, data generated in overhaul and maintenance operations are essential to accurate determinations concerning the range of items to be carried in supply inventories and the stock levels to be maintained. |
| 3.2.6 Requisition Processing | Requisition processing covers demands or requests for materiel against wholesale inventory records for the purpose of issuing materiel in response to requisitions, in accordance with established issue priority system guidelines, and the framework of related processes before materiel is released for shipment. The UMMIPS helps satisfy the need to identify the relative importance of competing demands for logistics system resources such as transportation, warehousing, data processing, and materiel inventories. The system establishes guidance for ranking materiel requirements, as well as incremental time standards for processing requisitions and moving materiel. |
| 3.2.7 Retail Excess Processing (Returns) | This term refers to logistics processes related to review, authorization, and disposition of materiel reported from below the wholesale level that is identified as surplus or excess to projected needs. |
| 3.2.8 Wholesale Excessing | Excesses are determined by the National ICPs, using economic retention criteria, as part of the process of requirements determination. The retention formula shows when the cost of retaining an item is equal to the cost of disposing of it, with the knowledge that procurement may be necessary at a later date. |
| 3.2.9 Discrepancies | This is the process of documenting and resolving discrepancies in materiel and shipments, including supply-type, quality, and transportation discrepancies. |

Other procedures that should be included in the DLSS are:

- Provisioning procedures, to support early logistics organizational involvement and specification of manual and automated interfaces between weapons system development and weapons system operational maintenance logistics
- Retail demand stockage levels and user-requirement forecasts based on projected operations levels, both of which must be considered and factored into determining wholesale requirements
- Control and management of war reserve materiel requirements, which should be standardized throughout DoD as part of both implementation of weapons system management procedures and improvement in interfaces between Services and joint activities . This procedure is discussed in more detail in Part II, Section A.5.

> *MODELS Requirement:* The expanded DLSS must develop DoD standards for analysis of demand and presentation of requirements data, including initial provisioning procedures and the control and management of war reserve materiel requirements.

D.2.b Cataloging.

The DIDS is a DoD-wide system administered by DLA and operated by the Defense Logistics Services Center (DLSC) and is the national cataloging data base for more than 4 million items designated and specified by an NSN. S/As perform their own cataloging under standard rules prescribed by DLSC. However, weapons system identification and a broad range of related logistical functions are expected to become key issues for MODELS. Because of the expanded scope of the DLSS discussed here, as well as other issues and considerations discussed throughout the remainder of this report, consideration must be given to coordinating cataloging interface standards into the MODELS conceptual design, particularly:

- Item Identification
  - Cataloging of new supply items, including weapons system application data, pilferable and sensitive item identifiers, and hazardous materiel codes

- Interchangeability and substitutability between items
- Item reduction – redundancy versus unique-application specificity

- Catalog management – maintenance of S/A data bases, need for DAAS-type catalog data and source of supply validations
- Documentation and publication – on-line access, use of new media, such as optical disk technology
- Logistical reassignments (because of catalog changes).

*MODELS Requirement:* The MODELS concept should review DIDS modernization requirements and plans and closely coordinate the MODELS conceptual design to accommodate future DIDS capabilities.

D.2.c Inventory Control.

MILSTRAP is now the DLSS vehicle for prescribing inventory control interface standards. However, some procedures are directed by other publications, such as DoD 4140.26-M, "Defense Integrated Materiel Management Manual for Consumable Items." A comprehensive set of DLSS-expanded *inventory control interface standards* should include procedures for:

- Issue processing
- Replenishment actions
- Establishment of due-ins, pre-positioning – a standardized data base design would facilitate the use of bar-code technology in receipt processing
- Receipts – processing and inventory accounting, interface with depot functions
  - Receipts from vendors – interface with contract administration and quality assurance functions
  - Returns from customers – interface with redistribution and reutilization functions
- Adjustments to inventory
  - Purpose, ownership, condition coding, and changes
  - Losses, gains of inventory – accountability, interface with physical inventory function

- Demand accumulation – interface with retail requirements
- Re-identification (catalog changes)
- Logistical reassignments (negotiated).

The Integrated Material Manager (IMM) should have DoD-wide asset visibility down to the lowest supply echelon and should maintain visibility of items in R&M. The IMM could use this visibility of wholesale and retail stocks after consultation with retail stock managers concerning near-term local requirements, to make decisions pertaining to procurement, repair, retention, and disposal. The IMM would thus be in a better position to recommend redistribution of excess stocks, when appropriate, and to help facilitate emergency access to DoD inventories that may not be in excess. The Services now lack the full asset visibility required. Moreover, visibility of assets in the "industrial funds" is minimal. A higher level of asset visibility should be incorporated into the MODELS concept, if possible.

> *MODELS Requirement:* All inventory management and control issues and procedures should be integrated in an expanded DLSS. Within this integrated environment, the MODELS design must provide the IMM the capability for on-line DoD-wide asset visibility.

D.2.d Distribution and Redistribution.

Distribution and redistribution are partially standardized under MILSTRIP and MILSTRAP. However, authority and procedures for secondary item asset visibility and lateral redistribution is provided under DoDI 4140.37, *Asset Knowledge and Control of Secondary Items.* In-theater, lateral redistribution is still largely limited to Defense European and Pacific Redistribution Activity (DEPRA) processing at the Defense Automated Addressing System Office (DAASO), prescribed in DoD 4140.17-M, Supplement 3, *MILSTRIP DEPRA Procedures.* During the past several years, an attempt has been made to consolidate material returns and redistribution under one procedure. The Approved MILSTRIP Change Letter

(AMCL) 121A, *Materiel Returns Program (MRP) Redistribution Procedures*, would have placed all distribution, returns, and redistribution procedures under the responsibility of the IMM; however, the attempt failed and the proposal was withdrawn. In July 1986, the Army opened the European Redistribution Facility to ensure economical reutilization of assets within theater before returning excess asset to CONUS depots.

To optimize the efficiency of the distribution of demand and replenishment stocks and the redistribution of surplus/excess material, however, the IMM needs full visibility of available assets, as discussed in Section D.1.e and further described in Section F.1.

> *MODELS Requirement:* Distribution and redistribution procedures should be consolidated under one expanded DLSS procedure for wholesale supply management.

D.2.e Repair and/or Rebuild.

Repair and/or rebuild-related information exchange transactions within DLSS procedures are very limited. MILSTRIP provides a transaction for automatic return and reissue of reparable carcasses (Nonconsumable Item Material Support Code, NIMSC5, unserviceable items), with notifications between Primary Inventory Control Activities (PICAs) and Secondary Inventory Control Activities (SICAs) of the return and the storage activity to which the item(s) are being shipped. Several other repair and/or rebuild activities affect supply wholesale inventories, but standard inter-S/A transactions do not now exist for exchanging pertinent information. The modernized, expanded DLSS must, therefore include a full interface to maintenance requirements, particularly depot-level maintenance and commercially-operated maintenance. Standard policies and procedures should be developed for exchange and reissue, and specific rules and formulas should be defined for the level of credit allowed.

*MODELS Requirement:* The MODELS concept must provide an automated information interface for maintenance requirements. The modernized DLSS must provide for the induction and return of reparables, so that the IMM/IM (owning) has the necessary asset visibility to allow for proper control, and to take asset status into consideration when performing procurements and redistributions.

D.2.f Requisition Processing.

Requisition processing is extensively covered in MILSTRIP procedures. MODELS, however, will incorporate the additional functional elements (requirements, source-of-supply determination, etc), shown in Figure D-8 and discussed in the following subsections. Within the modernized function, several additional standardized procedures should be included.

A requirement that must be addressed during development of the variable-length-record transaction is the provision of accurate system tracking of split or partial supply actions and suffix assignments. One solution might be to include both suffix split from and the current suffix in the variable-length transaction; that would provide improved supply management.

*MODELS Requirement:* Requisition history retention periods for each type of transaction should be standardized. Visibility of referrals, backorders, depot denials, and cancellations should be enhanced.

Another standardized procedure should address the response of the logistic system to JCS and Unified Command direction in crisis or war regarding allocation of materiel. The logistic system must be able to allocate materiel correctly in response to JCS objectives and Unified Command requirements.

*MODELS Requirement:* The MODELS concept must provide for correct response of the logistic system to JCS and Unified Command allocation guidance.

D.2.f(1) Requisition Edits.

Requisition edits, including data validation (what, where, by whom) and priority (UMMIPS and additional rules imposed by policy), evolved gradually in the present DLSS. Conflicting priorities (e.g., supply versus transportation) must be resolved, first by policy, then by implementation in the DLSS. Many MILSTRIP and S/A unique edits are being performed by DAAS.

> *MODELS Requirement:* The use of priority codes, project codes, and weapons system codes in the requisition transaction must be defined and accommodated in the MODELS concept. Requisition edits by the supply source and intervening third parties (such as DAAS) need to be integrated under the DLSS.

D.2.f(2) Source-of-Supply Determination.

Source-of-supply information is maintained today by requisitioners, DAAS, DLSC, and the supply source. Redundancy is widespread and thus conflicts are frequent. Separate catalog data bases contribute to the problem. Automated routing of transactions can lead to "pingponging" between processing points. Errors cross functional boundaries and are therefore difficult to resolve.

> *MODELS Requirement:* MODELS should provide a better approach to accessing source-of-supply information and to resolving conflicts.

D.2.f(3) Methods of Supply Determination.

Methods of supply determination processes include determining supply source, creating and maintaining of updated catalog information, and timely notification to the requisitioner of supply source actions and the effects on delivery schedules, pricing, and availability. These three processes are not addressed by the DLSS.

> *MODELS Requirement:* MODELS must establish standards for methods of supply determination processes to assure responsive support of user requirements.

D.2.f(4) Materiel Release Processing.

MILSTRIP prescribes standard transactions for materiel release, materiel release confirmation, materiel release denial, and Navy-unique referral orders. Serious problems exist in processing and controlling of these functions, and those problems tend to cross S/A lines and are both causes and effects of discontinuities between depot and ICP inventory and issue systems, as well as loss of inventory accountability. Automated information collection procedures as a normal function of operations are needed to provide a means of tracking MROs at depots and of ensuring accurate reporting of Materiel Release Confirmations (MRCs). Improved interfaces, including on-line access, may be required for balancing ICP and depot records; as discussed later in Part II, Section B.5, a unified data base may be both required and feasible under MODELS. Billing is not consistently integrated with release procedures, resulting in discontinuities between the processes.

> *MODELS Requirement:* The MODELS concept should include a method for providing denial status directly to requisitioners either at a retail-supply point or through the retail-supply point system to end-user requisitioners. Standardized procedures and time frames are needed to improve data retention for depot records and for the use of constructive delivery-and-receipt concepts for billing purposes throughout all levels of the logistics community.

D.2.f(5) Status.

Requirements for batch processing and automatic transmission of requisition status (pushed) should be evaluated in light of new system architecture alternatives. The issue is whether to continue pushing transactions based on the requisitioner-coded instructions or to limit pushed transactions being communicated to requisitioning facilities to specific situations. As a result of the present push procedure, large volumes of transactions (more than 6 million a month) are communicated to requisitioning facilities as well as centralized repositories of logistics data.

*MODELS Requirement:* MODELS should evaluate the continuing need for pushed follow-ups, especially to update centralized data bases maintained by the S/As, if interactive inquiry gateway capability is established throughout the logistics system network. This change would require that standardized procedures and guidelines be promulgated for inquiry capability.

D.2.f(6) Modifiers.

Modification of requisition data in the current DLSS procedures is cumbersome. In addition, once a requisition has entered the issue cycle, it is virtually impossible to modify any aspect of its properties, from the quantity to the ship-to address. Still, the logistics system is constantly in motion – demands change and units move. Therefore, MODELS must develop procedures for expanding and enhancing requisition modification techniques. These improved procedures must accommodate and facilitate *mass* modifications associated with unit movements, i.e., mass changes of ship-to addresses.

The most obvious solution is the incorporation of on-line, interactive change capability. However, accountability safeguards and audit trails must be established to make sure that a transaction history is maintained, that access is duly authorized, and that such changes as ship-to address are authenticated to prevent fraud and abuse.

D.2.f(7) Cancellations.

Cancellations now face the same difficulties as modifications, in that once the issue cycle starts, canceling a requisition is very difficult. However, improved information requirements, forecasting, and visibility of assets and status will increase the user's information base for cancellation decisions. On the other hand, greater visibility and more timely availability of information should also reduce the need for cancellations, particularly mass cancellations.

Improved cancellation procedures are particularly important for overseas shipments. These procedures must interface with transportation management and port operation systems to enhance capability for intercepting and diverting shipments.

> *MODELS Requirement:* MODELS must incorporate improved interface capabilities to permit timely processing of modifications and cancellations. Also, modernized DLSS must include procedures and standard rules concerning the stages at which changes can be made (during which segments of the pipeline process), what changes are authorized with various modes of data access (interactive versus transactional), and who is authorized to initiate interactive changes, taking appropriate precautions on access and record-level security.

D.2.f(8) Backorders.

Backorder processing procedures should be improved under MODELS. The present follow-up response to backordered material is a manual, sometimes overlooked, process. Not-mission-capable-supply requirements may be backordered routinely. The process should be integrated with present contract administration procedures to provide automatic updates to the IM and the requisitioner on the contract award schedule, expected delivery schedule, and any changes in projected delivery dates. When a requisition enters the backorder process, such performance standards as UMMIPS are no longer applicable. While backorder processing is measured indirectly in MILSTEP Format 2 (ICP availability performance) and Format 1B (pipeline performance for delayed issue), additional direct measurements, for example, average time and quantity in backorder by priority code, are needed if the backorder process is to get appropriate operational and management attention.

An issue of particular importance is development and implementation of standard procedures for special processing Priority Group 1 requisitions in a backorder status. Exception purchase or local purchase rules should be developed and implemented for the IM.

The Materiel Obligation Validation (MOV) process should be reviewed again. New technology, modified DLSS procedures, and more frequent "electronically mailed" internal validations may remove the need for the cyclic MOV procedure. While the MOV process is in place, however, the effects of MOV procedures should be tracked better so that its real effects can be compared with perceived cost savings.

Automating the contract administration process and providing access to more timely contract performance information should result in more realistic release dates on vendor deliveries.

> *MODELS Requirement:* DLSS guidelines and procedures for processing backorder releases need to be developed and implemented. A priority processing scheme similar to that used for in-process requisitions should be applied to backorder release processing. Partial shipments of priority materiel should be considered, and rules and automated procedures should be developed to standardize when such shipments can be authorized and by whom.

D.2.g Retail Excess Processing (Returns).

Standard procedures should be implemented in the requisitioning process to require interface with and search of normal and declared excess stock available at retail levels before processing additional procurements. Improved visibility of retail assets, as noted earlier in Section D.1.e, is vital to successful improvement of excess processing. If materiel is backordered, automated procedures should be implemented to perform a thorough daily or weekly search of the logistics network(s), electronically, for newly identified excess retail stocks.

To complement improved excess identification procedures, the DLSS should develop DoD-wide redistribution procedures to be automated in the MODELS implementation.

> *MODELS Requirement:* MODELS must improve IM visibility of retail excess materiel. Also, the DLSS should identify procedures to integrate retail returns with discrepancy processing systems.

D.2.h Wholesale Excessing.

Wholesale excess materiel, although still in good condition, must be entered quickly into an automated, on-line reutilization and marketing data base so that its availability will be widely known. The disposal turn-in procedures should be changed. Materiel proposed for excessing should be identified earlier, availability dates should be announced as soon as possible, and the condition coding process should be improved.

> *MODELS Requirement:* Procedures for ICP determination and processing of wholesale excess materiel need improvement.

D.2.i Discrepancies.

Although only RODs are in the current DLSS scope of standardization, the various DLSS also have incomplete interfaces with TDRs and QDRs. These interfaces should be complete to maximize the effectiveness of the discrepancy reporting process.

Functions to be included in standardized discrepancy procedures are:

- Documentation – electronic data interchange interfaces with industry (vendors and carriers)
  - Customer reporting – automation under MRASDRS
  - Wholesale receipt discrepancies – coverage in MILSTRAP and MRASDRS
- Investigation and research into shipment records, shipment tracing, and other causative factors, including
  - Inspection – interface with quality assurance function
  - Inventory – interface with physical inventory function
- Disposition
  - Response to customers, contract administration actions, carrier claims, etc.

- Adjustments
  - Credits
  - Stock replacement
  - Materiel disposition.

Incorporation and interface of all discrepancy reports and procedures would improve cross-correlation of problems. For example, the procedures could link RODs and inventory discrepancies to determine whether a shipment receipt shortage is correlated with an inventory overage, or vice versa. Similarly, QDRs might be related to TDRs that are reported with excess delivery times. This integration would improve the whole reporting process and may assist in identifying causal relationships or deficiency trends.

> *MODELS Requirement:* The DLSS should define a standard set of reporting procedures for all types of discrepancies, in one procedural document. The MODELS concept should consider methods for automated integration of deficiency reporting procedures, through data base techniques and on-line, interactive information retrieval capabilities.

D.3 Technical Data Management.

Technical data, which is the link between personnel and equipment, includes operating and maintenance procedures, special test procedures, installation instructions, checklists, change notices and change procedures, drawings, photographs, etc., for the weapons systems, support equipment, training equipment, transportation and handling equipment, and repair/replacement assemblies and parts. Technical data management is the function that embraces identifying, coordinating, collating, validating, integrating, and controlling technical data requirements; ensuring the adequacy of cataloged technical data; and managing the use of technical data assets after receipt. [*Note:* The acquisition of technical data during contract performance or through procedures such as reverse engineering, is covered under Technical Data

Acquisition in Section C.3]. The function also includes standardizing the distribution of data acquired under contract and developing standard procedures for storage, retrieval, and disposal of technical data.

D.3.a Use and Management of Technical Data.

On-line access to technical data, drawings, and pictures will reduce or eliminate off-line documentation of exception requirements data and make possible greater control of the proliferation of locally-assigned stock numbers by encouraging positive identification of part numbers to NSNs before requisitions are generated. Requisitions for items that are not identifiable immediately can be suspended for interactive inquiry and data exchange.

Procedures will be needed to define standards for the use and transmission of technical data. Developing those procedures could be a major undertaking, considering the classified and/or proprietary nature of large amounts of technical data. The MODELS concept should explore methods to handle the storage and transmission or other distribution of technical data that is classified, proprietary, or both. These functions are being extensively reviewed and evaluated by the OSD CALS project.

> *MODELS Requirement:* DLSS procedures need to be developed to define standards for the use and transmission of technical data. The MODELS design must allow and promote on-line access to catalog and technical data, with full graphics capability for transmission and display of digitized images. This capability must incorporate CALS-developed procedure and protocol standards as discussed in Part I, Section C.3.

DoDIs establish the DoD technical data management program and define uniform policies and procedures for management and administration of (1) technical data acquired contractually in support of contract end-items, (2) technical data developed within DoD, and (3) the DoD Management Improvement Program concerned with the life of technical data.

These procedures and policies are mandatory in the management of internally prepared as well as contractually prepared data and also apply to furnishing of technical data to GSA for items managed by GSA for DoD. These procedures are not now within the scope of DLSS functional responsibilities.

A number of repositories of technical data exist throughout DoD. Some are manual operations with plans to automate; others have an index to the data maintained in their data bases, accessible through separate log on procedures and not accessible by remote users. These data, filed by drawing number and related to part number(s), include drawings, specifications, test requirements, and other data used to support cataloging, procurement, reverse engineering, and other logistics activities. DoD, other Federal Agencies, and some international organizations use these data.

DLA is now tasked to develop a data base index of technical drawings. What is needed, however, is more than an index to technical data. Once the drawing is located, the user should be able to retrieve the information on-line. Seeking, obtaining, and transmitting engineering technical information should be an integral part of the logistics system.

While the Services are updating automated procedures for retrieval of technical data, their efforts do not appear to be coordinated . Thus, those efforts will likely result in heterogeneous hardware and software that must be interfaced when information is retrieved by one S/A from another. Thus, the MODELS concept must incorporate the capability to transmit technical data specifications and drawings between heterogeneous systems.

OSD is sponsoring implementation of the CALS system environment. That project addresses many aspects of technical data acquisition and management, including classified and proprietary data, contract clauses, data maintenance, transmission protocols, and related requirements for effective technical data usage

throughout DoD. However, engineering drawings and technical data will not be accessible through the individual Service systems for 2 to 3 years, and the CALS project will be unable to address protocol standardization for inter-S/A retrieval and telecommunication of technical data even beyond that time. This standardization, when developed and documented, must be integrated into the MODELS concept and implementation plan.

> *MODELS Requirement:* The MODELS concept should provide for standardization of procedures for the exchange of technical data between the S/As.

Technical Data Management is divided into four functional areas: Acquisition, Cataloging, Storage, and Retrieval and Exchange. The WBS functions are illustrated in Figure D-9 and described in Table D-7.

D.3.b Cataloging.

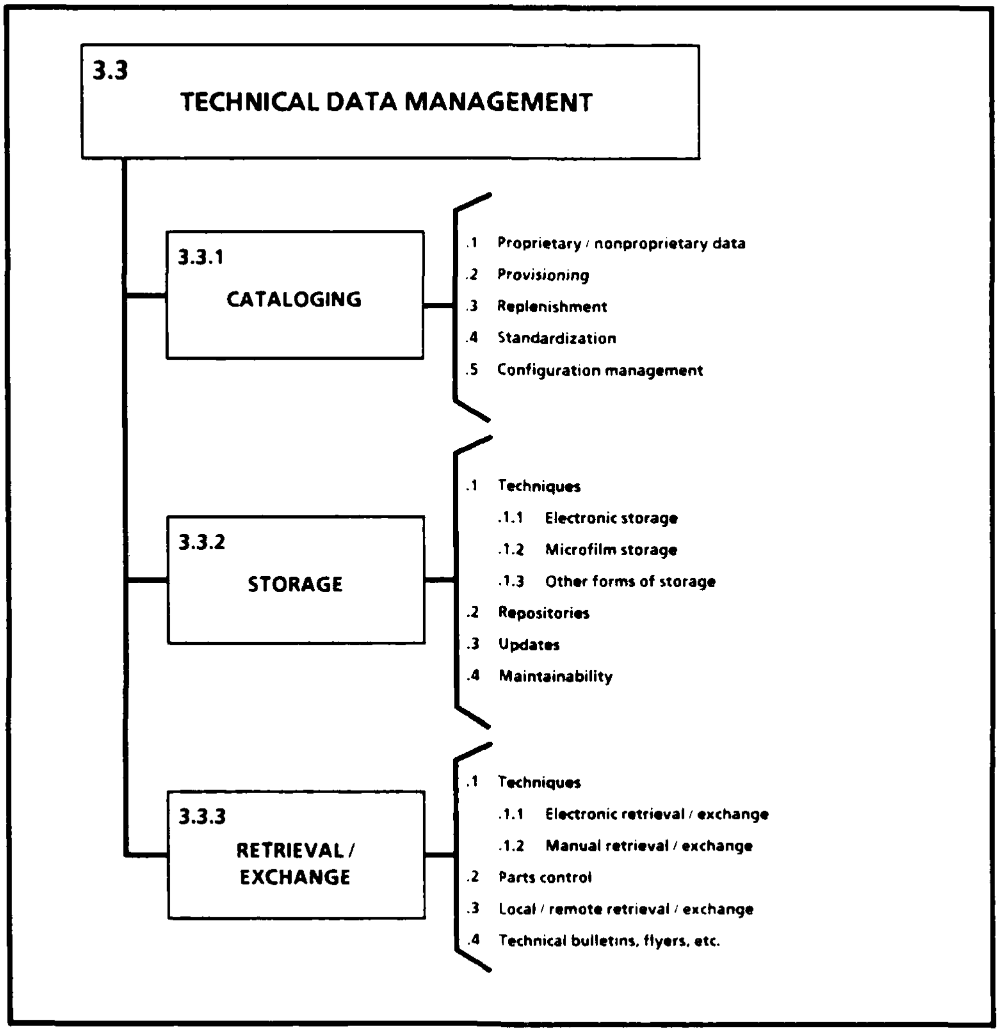
Technical data is now referenced by a drawing number and part number; it can also be traced through the manufacturer's identification code. Technical data must be related to the appropriate level of detail to meet user requirements, from end items, fully assembled (e.g., tank) through subassemblies and reparables (e.g., carburetor) to individual parts (e.g., carburetor float). Technical data cataloging procedures should accommodate proprietary as well as nonproprietary data and should provide the means for easy and quick access to technical data to improve the stock replenishment process.

> *MODELS Requirement:* The DLSS must provide for standardization of cataloging activities related to technical data, engineering drawings, and documents, in accordance with the OSD-CALS Group recommendations.

D.3.c Storage and Retrieval.

Both manual and automated techniques are used today for the storage and retrieval of technical data and engineering drawings. The current automated

FIGURE D-9. SUPPLY: TECHNICAL DATA MANAGEMENT FUNCTIONS




systems are "islands of automation" that do not support remote terminal access to their data bases. The Services have completed concept requirements determination and are in the process of selecting hardware and software to support on-line storage and retrieval of technical data specifications and drawings. The OSD-CALS project is addressing the standardization of protocols for technical data storage and retrieval and the development of separate protocols for engineering drawings. The standards defined by CALS and the National Bureau of Standards (NBS) will represent both DoD and private industry.

## TABLE D-7. DESCRIPTIONS: SUPPLY/TECHNICAL DATA MANAGEMENT FUNCTIONS

| FUNCTIONS | DEFINITIONS |
|---|---|
| 3.3 Technical Data Management | The management of the recorded information needed to translate system and equipment requirements into discrete engineering and logistic considerations. These data are necessary to develop, produce, support, operate, and maintain systems and equipment in a prescribed state of readiness. Technical data is the link between personnel and equipment and includes operating and maintenance procedures, special test procedures, installation instructions, checklists, change notices and change procedures, drawings, photographs, etc., for the weapons systems, support equipment, training equipment, transportation and handling equipment, and repair/replacement assemblies and parts |
| 3.3.1 Cataloging | The process of associating technical data specifications, drawings, pictures, and related data with DoD cataloged part numbers and NSNs. Technical data must be related to the appropriate level of detail to meet user requirements, from end items, fully assembled (e.g., tank) through subassemblies and reparables (e.g., carburetor) to individual parts (e.g., carburetor float) |
| 3.3.2 Storage | The maintenance of technical data in repositories that protect the information from deterioration and restrict access to authorized users but allow easy, efficient update and additions as physical configurations of materiel and equipment are changed. |
| 3.3.3 Retrieval and Exchange | The process of finding and collecting/collating technical information from the storage repositories for dissemination and distribution to authorized users. |

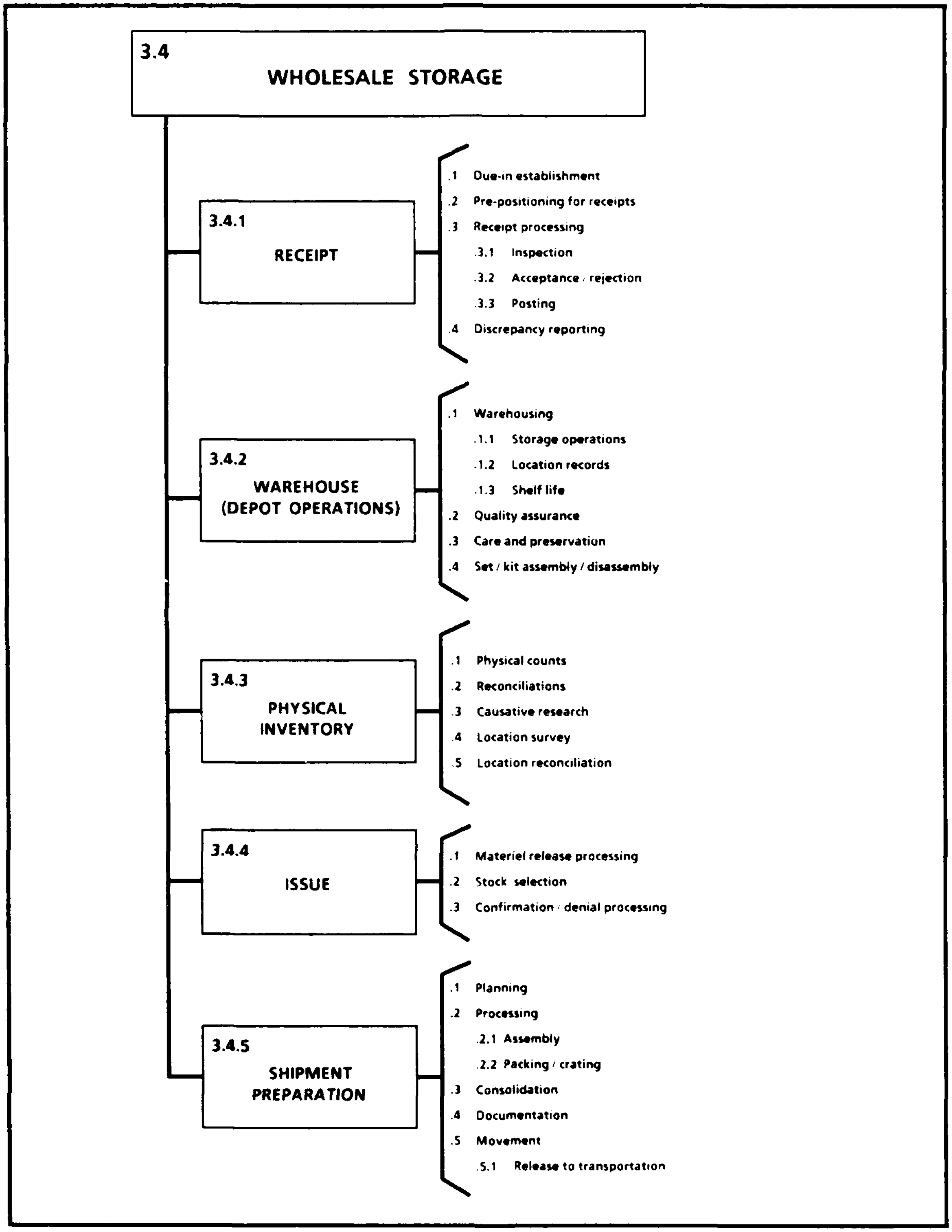
*MODELS Requirement:* The DLSS should incorporate the findings and recommendations of the CALS project for technical data storage and retrieval standardized procedures.

## D.4 Wholesale Storage.

The wholesale storage functions shown in Figure D-10 should be integrated. Thus, DLSS coverage should be expanded under the MODELS concept. Some general procedures for wholesale storage system interfaces to be standardized include:

- A method for correcting transaction errors, with appropriate audit trails, in accountable transactions. This procedure is particularly important for inventory control transactions.
- A process for improving reconciliations of inventory between ICP accountable records and storage site custodial records. This improvement can best be realized through distributed processing where there is only one set of records.

FIGURE D-10. SUPPLY: WHOLESALE STORAGE FUNCTIONS



The subfunctions to be included in the DLSS scope of coverage of wholesale storage are described in Table D-8. Subfunctions with specific modernized DLSS-expanded requirements are discussed below.

D.4.a Receipt.

Receiving and receipt processing are now given partial coverage in MILSTRAP, and further automation is proposed under MRASDRS. A critical need within this function is to make performance tracking and reporting an integral part of receipt processing rather than merely an extra process of data collection and entry. When that is done, the information will be more accurate and, in addition, the personnel involved will be more productive. Bar coding integrated with automated receiving systems and access to financial in-transits (accounts payable commitments) to detect discrepancies in quantity, will improve the receiving process substantially. Subfunctions to be included in the receipt function include:

- Due-in establishment
- Pre-positioning for receipts
- Receipt processing
- Discrepancy reporting for wholesale receipts
  - Report of Supply-Type Discrepancy, now included in ROD and MILSTRAP
  - TDR, now included in a separate joint regulation
  - QDR, now included in a separate joint regulation.

*MODELS Requirement:* Wholesale receipt procedures for information access and exchange between the depot and ICP should be fully covered under the modernized DLSS, including use of bar-coding technology, interface requirements to other logistics functions, and performance measurement/quality control processes.

## TABLE D-8. DESCRIPTIONS: SUPPLY/WHOLESALE STORAGE FUNCTIONS

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 3.4 Wholesale Storage | Those logistics functions concerned with management and operation of wholesale materiel storage sites – the process of storing or placing property in a wholesale warehouse or other designated wholesale facility, as well as actions incident to receipt and issue of such property |
| 3.4.1 Receipt | The processes of inspection, acceptance, and related actions incident to receipt of materiel, from the time the carrier arrives at the warehouse dock until stocks are properly stored on location and reported to the ICP for inventory pickup. It is important that this process be completed quickly so that shipments can be made on time, backorders can be released as soon as possible, and IMs can have timely balance information on which to base studies of requirements |
| 3.4.2 Warehousing (Depot Operations) | The warehousing operations encompassing the actual movement of materiel and space allocation within a storage site and the upkeep and maintenance of such materiel in place. Supply managers determine the proper storage location by considering many factors – for example, the length of time items may be expected to stay in storage, the sources of anticipated demand, the amount of space available, the expected frequency of issue, and the anticipated size of issue. An adequate system for locating stocks must be established and maintained so that items can be found and issued quickly. |
| 3.4.3 Physical Inventory | The process of accounting for and controlling stock on-hand. It includes the functions of physical counting, reconciliation of discrepancies, causative research, location surveys, and location reconciliations.<br>Physical counting is the actual counting of the quantity of stock on-hand in a designated stowage location and comparing the actual count to the depot and ICP accounting system quantity records. Physical counts are performed usually for one of two reasons. First, a legal requirement for an annual physical count for items such as ammunition, controlled items, and classified items. Second, a discrepancy between the quantity records of the depot and the official accountability records of the ICP. This discrepancy is most often the result of a depot denial to an MRO.<br>Reconciliation is the set of procedures, including physical count, used to correct quantity differences in inventory accounting records between the ICP and the depot.<br>Causative research is the process of identifying reasons for the differences in quantity accounting records between the ICP and depot. The primary objective is identification and correction of systemic problems with a secondary objective of finding the cause of a particular item discrepancy.<br>Location surveys are used to maintain the accuracy of the depot location records. The process involves a record-to-bin location and bin-back-to-record reconciliation. Bar-code readers are being used extensively at the depots to improve the accuracy and efficiency of location surveys.<br>Location reconciliation is a bottom-up process, from the depot to the ICP, identifying that a specific NSN item is in stock. The procedures only identify that the particular NSN is available at the depot (depot location), not the specific bin location, nor the quantity available. |
| 3.4.4 Issue | The process of authorizing and effecting release of materiel from wholesale inventory in response to a requisition or other validated requirement. All supply systems have procedures for formally releasing supplies to using activities or to another echelon in the distribution system<br>If the request for items is within the authorized allowance, funds are properly cited, and no other restrictions apply, the requested quantities are issued from available inventories.<br>If the quantities requested are not available, other decisions must be made; the request may be backordered against a quantity due in from contract or from another supply source; immediate procurement may be initiated; or the request may be passed to another supply agency that can fill the need<br>*The denial rate* is a measure of the compatibility between stock records at the ICP and materiel on-hand at the designated depot. A denial can be caused by inaccurate recordkeeping at the ICP or depot, improper location of stock, overshipment on previous orders, or incorrect inventory practices at the depot. For major items, supply response may involve overhaul of available assets in unserviceable condition or assembly of requested items from components held in stock |
| 3.4.5 Shipment Preparation | The logistics function that encompasses packaging, packing, documenting, and release of materiel for transportation to receiving activities. A significant portion of procurement dollars and depot supply operational costs go for preservation, packaging, packing, unitizing loads, blocking, and bracing. Different modes of transportation and different world destinations often dictate special packing and packaging specifications |

D.4.b Warehousing (Depot Operations).

Within the warehousing function, two special requirements must be addressed in future DLSS procedures. Within the DLSS quality assurance standards, better methods of recording, updating, and labeling shelf-life information must be included, in accordance with DoD 4140.27-M, *Identification, Control, and Utilization of Shelf-Life Items.* Particularly important is the requirement for defining methods and procedures for automatic and recurring notifications from the ICP IM to depot managers of approaching shelf-life end dates, along with the depot manager's own item management system notification requirements, thus avoiding waste and spoilage. As shelf-life end dates approach, the materiel accountability records should be reviewed on-line by the ICP IM for lateral redistribution considerations, through the retail asset visibility capability, previously described in Section D.2.c. Shelf-life information must also be provided on shipment documentation.

The second special area for MODELS design to address is inclusion of hazardous materiel procedures within the automated receiving and storage system. Hazardous materiel identification, handling and storage, and shipping procedures must be included in automated recordkeeping, either as a part of the DIDS catalog information or in depot-maintained files of hazardous materiel data. [*Note:* the MODELS project team must review ongoing DoD initiatives in hazardous materiel information interfaces in developing its conceptual information exchange interfaces during Phase 3 of this project.] This information should be included in the warehouse system for on-line access by both stowing and shipping personnel.

> *MODELS Requirement:* Modernized DLSS should integrate DoD 4140.27-M for shelf-life items and hazardous materiel procedures into an expanded wholesale storage standard.

D.4.c Physical Inventory.

The DLSS should standardize physical inventory procedures throughout DoD at all wholesale and retail logistics facilities under the Physical Inventory Program (PIP). These procedures should encompass the following functions described in Table D-8 under item 3.4.3, Physical Inventory:

- Physical counting
- Reconciliation
- Causative research
- Location surveys
- Location reconciliation.

> *MODELS Requirement:* The MODELS concept must include automated processes to accommodate and improve the productivity of conducting these procedures. Bar-coding technology must be accommodated for conducting physical inventory counts and location surveys.

D.4.d Issue.

Procedures for materiel issue, now prescribed in both MILSTRIP and MILSTRAP, should be consolidated into a single publication encompassing the issue functions described in Table D-8. The procedures should also standardize record retention periods, by record type.

The MODELS concept should consider how automated interfaces between ICP and depot can be improved to (1) provide more accurate, timely information to IMs concerning issues and (2) improve customer satisfaction with the issue process. Materiel release processing would be combined with issue posting to eliminate present problems with tracking depot actions on MROs and MRCs. Issue procedures should include the reporting of depot denials through the ICP to the requisitioner as a regular requisition status followup. Use of bar-coding technology, which now offers remote posting of the stock available data base as materiel is picked, would

allow for synchronizing drop from inventory with issue actions and on-line update of accountable/custodial records.

> *MODELS Requirement:* The MODELS concept must accommodate improved automated information exchange for issue procedures between the depot and ICP, as new technologies such as bar-code readers are introduced into depot issue processing.

D.4.e Shipment Preparation.

Procedures for materiel shipment preparation are now prescribed in MILSTRIP, MILSTAMP, and the MTMR. They include procedures for consolidation, labeling, and documentation. These procedures should be consolidated into a single set of DoD-wide shipment preparation procedures whether materiel is to be shipped within CONUS, overseas, or within the theater.

Within the consolidation function, shipment unit identification and the capability to identify specific materiel within the shipment should be reviewed and improved. This point is discussed in more detail in the requirements for the Transportation Function, in Section E.3, and again in Part II, Sections A.3 and A.5, in the discussion of interfaces between Services and joint activities.

Bar coding and EBDI are emerging hardware and software technologies that will have a significant impact on both DoD and the commercial transportation sectors.

> *MODELS Requirement:* Shipment preparation procedures should all be integrated in modernized DLSS procedures. The MODELS concept must be able to accommodate the full extent of information exchange requirements dictated by integrated procedures. The MODELS concept must also allow for and encourage the use of bar coding and EBDI standards for improved documentation and processing efficiency.

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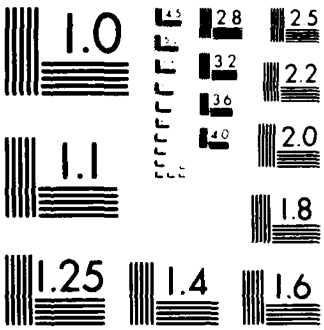


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NATIONAL BUREAU OF STANDARDS 1963 A

D.5 Nonsupply Interfaces.

In addition to the supply interfaces covered in this section, MODELS will require integration of supply with other major logistics functional areas.

The interface between supply and procurement is largely nonstandard and is often manual. MODELS provides an opportunity to automate and standardize many elements of the acquisition function, in addition to the supply interface.

DLSS now cover some of the interfaces between Defense Contract Administration Service (DCAS) functions and procurement activities, particularly in MILSCAP. Many interfaces with supply, transportation, and vendors/contractors could be automated within the MODELS concept (see the earlier discussion under Acquisition in Chapter C of this part). Paperless interfaces with commercial carriers and vendors using EBDI standards are possible. This topic is discussed in more detail in Part II, Section B.2.

MODELS should include interfaces with (1) programs for quality assurance and inspection of materiel at origin or destination, (2) depot quality programs, and (3) QDR investigations. Most are neither integrated nor automated but they should be. Transportation documentation and tracing are major concerns and are areas for the application of EBDI; they are discussed in Part II, Section A.2.

Present DLSS supply concerns in R&M are transfer to, and requisitioning from, disposal. Both of these functional elements are adopting current DLSS standards prescribed in MILSTRIP. MODELS should improve these interfaces, and provide the IM with visibility of assets available for reutilization.

# CHAPTER E. TRANSPORTATION FUNCTIONAL REQUIREMENTS

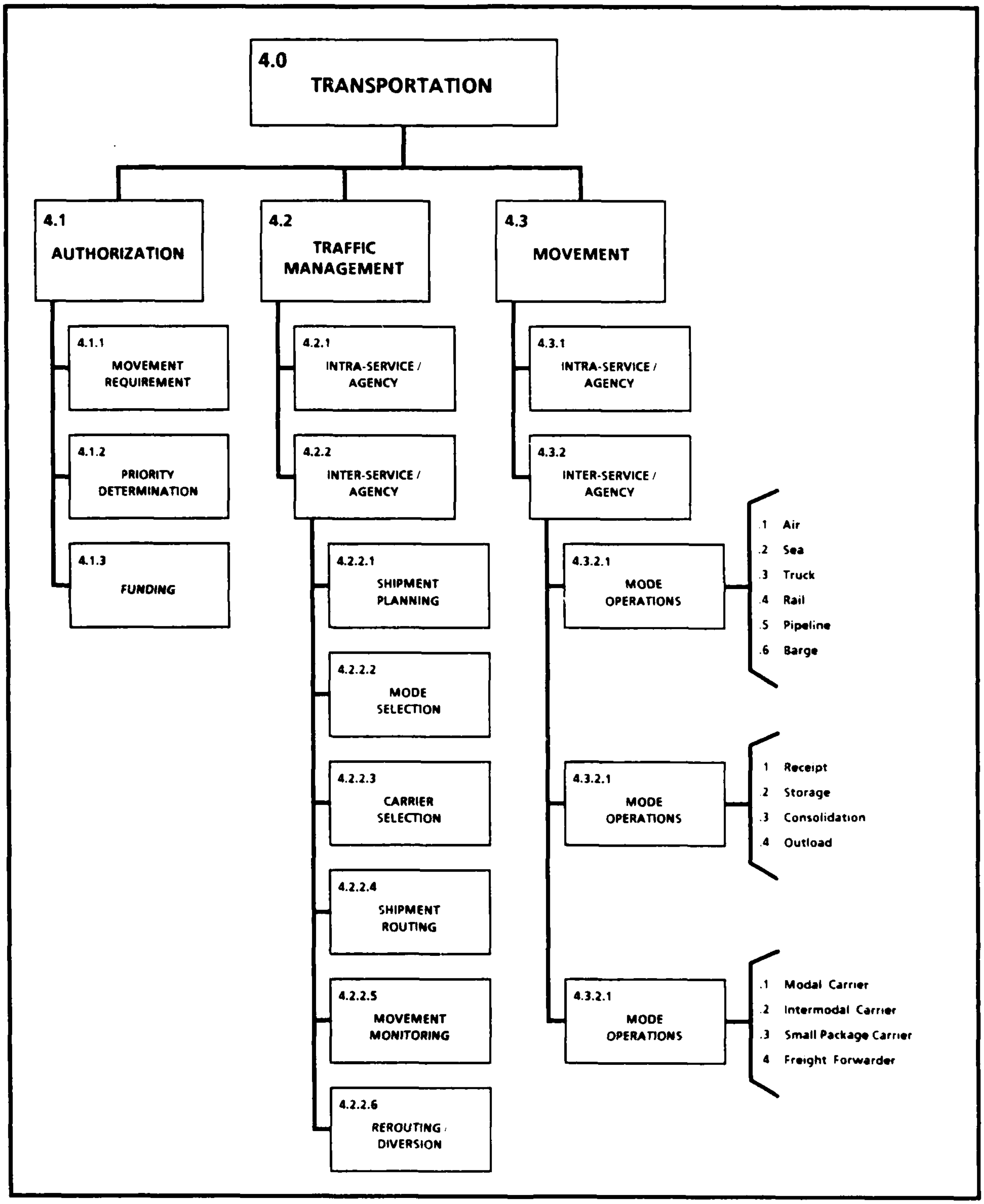
Military transportation and commercial for-hire contract transportation resources exist principally to move people and things from where they are to where they are needed.

Transportation can be described in terms of (1) a requirement to move something, that must be supported by an allocation of movement capability (authorization); (2) a determination of the manner in which the movement will take place (traffic management); and (3) the actual movement. All three of these functions are affected by urgency of need, method of movement options available, carriers available, costs, packaging, and shipment characteristics. These three major functions and their related WBS subfunctions are shown in Figure E-11, and described in Table E-9.

The MODELS concept will address the movement of materiel and equipment only. However, moving people, including both individuals and groups (such as units), is recognized as an important aspect of the defense transportation function. Since specific transportation resources can be utilized interchangeably for moving people or materiel and equipment, management of the defense transportation function's capability (military transportation assets and commercial for-hire contract transportation assets) must take all transportation requirements into account.

> *MODELS Requirement:* The MODELS concept must provide for a more comprehensive exchange of transportation information/data with all logistics community activities and also some activities that are not included in the defense logistics operations/management environment, particularly JCS, the Joint Deployment Agency (JDA), and the Commanders-in-Chief (CINCs).

**FIGURE E-11. TRANSPORTATION FUNCTIONS**



## TABLE E-9. DESCRIPTIONS: TRANSPORTATION FUNCTIONS

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 4.0 Transportation | The activities related to the movement of personnel, equipment, and supplies in support of military operations or other requirements It includes planning, authorization, routing, scheduling, and movement. It also includes procurement of these services from commercial or other sources |
| 4.1 Authorization | The act of specifying to the provider of transportation the requesting organization's sanction of a specific movement requirement. Authorization normally includes a description of what is to be moved, the origin, the destination, the priority, and a fund citation |
| 4.1 1 Movement Requirement | The determination that it is necessary for an organization to move a specified number of personnel or amount of material between two or more locations. |
| 4.1 2 Priority Determination | The assignment of relative importance to movement requirements Normally accomplished in accordance with established rules, general or specific |
| 4 1.3 Funding | The act of designating specific authority to charge the cost of providing transportation to an organization In some cases, such as the utilization of internal transportation resources, this may not be an overt act for each requirement It is normally a specific requirement for any inter-Service transportation support and the procurement of commercial transportation support |
| 4.2 Traffic Management | The planning, routing, scheduling, and control of personnel and material movements, including the procurement of commercial capability. |
| 4.2.1 Intra-Service/ Agency | Traffic management activities within an S/A Decisions and procedures are governed by S/A and jointly established policies and procedures. |
| 4.2.2 Inter-Service/ Agency | Traffic management activities that involve two or more S/As Includes development of joint policies and procedures. |
| 4.2.2.1 Shipment Planning | The process of collecting information on movement requirements and evaluating the various factors involved in satisfying movement requirements in the most economical way consistent with UMMIPS priorities and other operational considerations |
| 4.2 2.2 Mode Selection | The process that results in a decision to move personnel or materiel by a specific type of transportation or to procure the services of a travel agent or freight forwarder |
| 4.2 2.3 Carrier Selection | The process that results in a decision to move personnel or materiel by a specific military or civilian operator of transportation capability. The operator may utilize more than one mode to accomplish a specific movement. |
| 4.2.2.4 Shipment Routing | The process of arriving at a decision to execute a given movement over a specific route or combination of routes. This may be a traffic management decision, a mode operator decision, or a combination of the two It may be incorporated into the selection of carrier and mode decisions |
| 4.2.2.5 Movement Monitoring | The process of tracking a specific movement Tracking movements range from determining when a shipment arrives at a destination in relation to its scheduled arrival to relatively complex reporting of location as the movement proceeds along a specific route in accordance with a prearranged schedule. |
| 4.2.2.6 Rerouting/ Diversion | The act of changing the routing of a movement or changing the mode or carrier in response to some unforeseen requirement or to overcome unscheduled delays to meet the original requirements. Includes the Select mode, Select carrier, and Routing decision processes |
| 4 3 Movement | Activities related to the operation of transportation modes Includes planning, programming, and budgeting for operation of transportation resources, such as trucks, airplanes, and ships and the operation of modal and intermodal terminals Also includes procurement of similar capabilities from commercial and other sources |
| 4 3 1 Intra-Service/ Agency | Activities related to managing and operating transportation within an S/A Includes procurement of transportation from commercial or other sources, and controls for reimbursement of industrially funded transportation activities |

**TABLE E-9. DESCRIPTIONS: TRANSPORTATION FUNCTIONS (CONTINUED)**

| FUNCTIONS | DESCRIPTIONS |
|---|---|
| 4 3.2 Inter-Service/ Agency | Activities related to the management and operations of transportation where two or more S/As are involved Normally refers to operation of the Transportation Operating Agencies (TOAs) providing common-user transportation support to all DoD customers and other authorized agencies Includes the fiscal controls for reimbursement of industrially-funded TOA activities |
| 4.3.2 1 Mode Operations | Planning, programming, budgeting, and operation of specific modes of transportation May include modal or intermodal terminal operations May also include procurement of commercial or other modal capability to augment internal capability |
| 4 3.2.1 1 Air | Operation of the DoD common-user airlift capability and procurement of commercial or other augmentation to this capability Includes operation of common-user aerial ports of embarkation and debarkation and procurement of aerial port services |
| 4 3.2 1 2 Sea | Operation of the DoD common-user sealift capability and procurement of commercial or other augmentation of this capability Includes procurement of terminal services under certain conditions |
| 4.3.2 1.3 Truck | In theaters of operation, the operation of common-user truck transportation or procurement of truck transportation |
| 4.3.2 1 4 Rail | In theaters of operation, operation of common-user rail transportation if any, or procurement of rail transportation. |
| 4.3.2.1.5 Pipeline | In theaters of operation, operation of common-user pipeline transportation, if any, or procurement of pipeline transportation for movement of fuel |
| 4.3.2.1.6 Barge | In theaters of operation, operation of common-user barge transportation or procurement of barge transportation. |
| 4.3.2.2 Terminal Operations | Planning, programming, budgeting, and operation of transportation terminals. May be modal, but are normally intermodal. May be operated by a modal carrier or an independent organization |
| 4 3.2.2.1 Receipt | Activities associated with unloading and checking cargo. |
| 4.3.2.2.2 Storage | Activities associated with temporary retention of cargo at transportation nodes pending further movement. |
| 4.3.2.2.2 Consolidation | Collection of two or more shipment units into one larger shipment unit for improved movement efficiency. Also includes breakbulk operations in delivery areas. |
| 4.3.2.2.4 Outload | Activities associated with the further movement of cargo and recording of that movement |
| 4.3.2.3 Commercial Movement | Procurement of transportation services from commercial or other sources All or any portion of a movement may be procured, and the services procured may include some degree of traffic management. Does not include procurement of transportation capability to augment internal capability where management of transportation service is retained by an S/A |
| 4 3.2 3.1 Modal Carrier | Activities associated with shipping by commercial modal carrier, in accordance with traffic management decisions, and documenting the service provided |
| 4 3.2 3 2 Intermodal Carrier | Activities associated with shipping by commercial intermodal carrier, in accordance with traffic management decisions, and recording the service provided |
| 4 3 2 3 3 Small Package Carrier | Activities associated with shipping by small package carrier (including the Postal Service) and recording the shipment, if required |
| 4 3 2 3 4 Freight Forwarder | Activities associated with shipping by commercial freight forwarder in accordance with traffic management decisions and recording the service provided |

Transportation support for the DoD falls into three categories, in-CONUS, overseas, and in-theater. In-CONUS, basic procedural transportation guidance is provided by the MTMR, MILSTAMP, and similar Service publications. The trans port capability for CONUS movements is, for all practical purposes, procured entirely from the commercial world. The MTMR and other DoD and S/A policies and procedures overlay incompatible commercial documentation and data requirements.

The DTS, in the classic sense of MILSTAMP and the TOAs, supports the second category of transportation, DoD's international transportation requirements (e.g., overseas shipments). The DTS is composed of airlift provided by the Military Airlift Command (MAC), sealift provided by the Military Sealift Command (MSC) and water-port operations provided by the Military Traffic Management Command (MTMC). In the DTS, the military is the major operational entity. Some military assets are used; they are principally MAC's air cargo capability, MSC's very limited military sealift capability, and a few military terminals and ports. Those assets are augmented by commercial carrier contracts or charters for ships or aircraft to be operated under military operational control. When the overseas movement requirement is offered to commercial carriers using their own assets, the movement of military cargo may be intermingled with that of commercial cargo (principally by surface), with the commercial operator being in operational control of the movement. DTS management procedures are predicated on MILSTAMP. MILSTAMP data and documentation requirements are not always effectively interfaced with MTMR procedures e.g., the Government Bill of Lading (GBL) stems from the MTMR not the MILSTAMP, and they overlay commercial procedures, documentation, and data in some cases, principally sealift and water-port operations.

*MODELS Requirement:* The MODELS concept must provide for a reduction of paperwork and must improve the flow of compatible data, on a near-real-time basis in some cases, within the defense transportation function and to and from other organizations, including commercial carriers. EBDI concepts and standards must be incorporated. (This topic is discussed in detail in Part II, Section B.2.)

The third category of DoD transportation is that provided within a theater. Policies and procedures vary from theater to theater, reflecting the evolution of each theater. Various Service policies and procedures are used, as well as, to some extent, MILSTAMP. Transportation capability may be heavily military. However, commercial augmentation is frequently used, including support for active military operations as was done in Vietnam.

*MODELS Requirement:* The DLSS-expanded functions must provide for evaluation and development of procedures and data exchange requirements in theaters of operation, compatible with the DTS and CONUS-based activities that provide transportation data to the theater or require data from the theater.

Execution of these simple concepts within DoD is a complex process, with the complexity stemming from two major factors: myriad heterogeneous DoD organizations are involved in the total transportation function, and transportation is a support function for both strategic and tactical operations as well as logistics operations. A contributing factor is that transportation is captive (or reactive) to other logistics functions, principally supply, and strategic and tactical decisions.

*MODELS Requirement:* The MODELS concept must provide for evolutionary development of a near-real-time capability to provide information and data to assist MTMC in managing the transportation function in support of logistics activities.

### E.1 Authorization.

Authorization for transportation is a S/A responsibility. Transportation is a response to requirements for movement, requirements that are established by the same elements of the S/As that under OSD/JCS guidance also establish the priorities

for movements. Since most transportation support is provided by commercial sources or the industrially-funded TOAs, funding is one element in the decision process leading to movement authorization.

During crisis or wartime conditions, the JCS in coordination with the CINCs, become responsible for authorizing and prioritizing transportation requirements, and the JDA is assigned the task of collecting and reporting the information required for JCS decision-making. This function and JDA-supply-transportation information issues are discussed in more detail in Part II, Section A.5.

E.2 Traffic Management.

Traffic management – the direction (but not control) and monitoring of the movement of people and things – is the keystone of the transportation function. Most transportation policy emanates from the traffic management function. The authorization decision process is often dependent upon traffic management contributions, such as service (e.g., get it there by a certain time or at a reasonable cost). Movement (operation of the modes of transportation) is reactive to traffic management decisions. The traffic management process ranges from an intuitive decision to move something in a certain way to the complex process of planning the movement of massive amounts of materiel (and people) from many origins to many destinations, using several modes, operators, and routes.

> *MODELS Requirement:* The MODELS concept must provide for continuing improvements in the exchange of data between activities engaged in the authorization decision process and the traffic management function.

In its purest sense, traffic management is separate and distinct from movement. In DoD, however, these two functions tend to merge in some cases, particularly in the passenger transportation field. The separation of traffic management and movement is more distinct in the wholesale logistics area than at the operating

levels in the S/As. The real-world merger of the two transportation functions should have little or no impact on the MODELS concept.

Traffic management shares with movement the limelight of customer visibility. When customers have questions or problems with transportation, shippers turn to traffic management with their demands for information and receivers generally turn to operators. Other activities, such as joint and S/A headquarters, may turn to either or both. Shippers, receivers, and the many other activities – both logistics and other organizations – concerned with transportation management support have legitimate needs for transportation information and data. However, often, the requester does not speak the same language as the DoD transportation activity coordinators. This problem is addressed in Part II, Section A.3.

> *MODELS Requirement:* The MODELS concept must provide for a reasonable interchange of information and data between transportation activities and both nontransportation and nonlogistics activities.

E.3 Movement.

The movement function within transportation is by far the largest and most important generator of transportation information and data. That function provides information about what is happening or has happened as opposed to what will happen.

Most of the information generated in the course of moving materiel is of interest only to the activities within the transportation function. For example, the amount of fuel required for an aircraft is of little interest to the shippers and receivers of the cargo the aircraft is carrying. Other operational information, however, is of more interest to the customer. For example, how long it takes to fly from point A to point B may be of some limited interest; when the cargo will be delivered, taking into account loading/unloading, processing, and other time, is of prime interest to the customer.

The level of data available from the movement subfunction varies. Usually no record is made of shipments sent through the U.S. Postal Service. However, some movements, such as those requiring a signature whenever a shipment changes hands, generate a great deal of data.

In current practice, particularly within CONUS, logistics movements are made by bill of lading or waybill and little or no reporting or recording of movement increments occurs. Although more detailed records are kept in the DTS [through the use of Transportation Control and Movement Data (TCMD) and Transportation Control Numbers (TCNs) as prescribed by MILSTAMP], again very little reporting of movement increments takes place. Even though reporting of every detail is not necessary, recording detail and having it available when required is important. Automated recordkeeping and reporting capabilities must expand on the already existing capabilities to trace and report, when required, the location of items, both individually (for critical/protected cargo) and collectively. These are the requirements:

- The level of detail in reports should be kept as low as is operationally feasible
- Exception reporting should be the rule
- Communications requirements must be considered, particularly in crisis and wartime
- Reporting requirements should be based on data that are generated by transportation operations, not data that are produced solely for reporting purposes
- User-friendly, common language terminology rather than ADP language, must be used to respond to users' requirements.

> *MODELS Requirement:* The MODELS concept must provide for improving existing capabilities for recording and reporting of transportation movement information and data.

## CHAPTER F. REUTILIZATION AND MARKETING

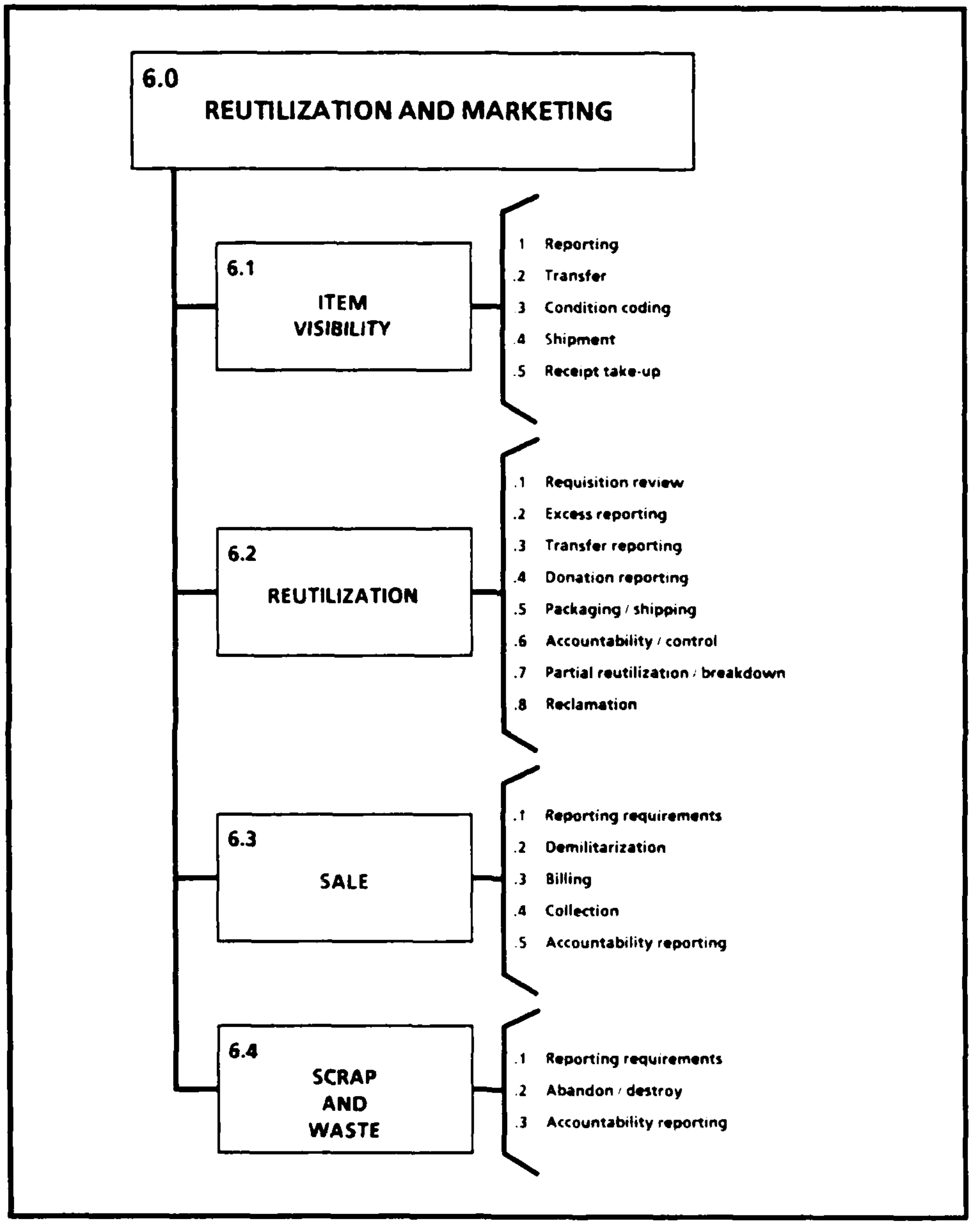
This function encompasses reutilization, sale, or disposal by other means of DoD excess and surplus property. Present DLSS procedures in MILSTRIP addressing this function are confined to shipment to and requisitioning from DRMOs. The functions actually encompassed by DRMOs are to receive, process, control, distribute, market, and dispose of excess/surplus military property. An additional capability to be added to this list – and one critical to the cost-effective accomplishment of the other functions – is item visibility. These DRMO functions are shown in Figure F-12 and described in Table F-10.

DRMS is headquartered in Battle Creek, Michigan, and its worldwide network of more than 130 DRMOs and more than 80 off-site branches receives approximately 3 million excess items annually valued at almost $5 billion. Approximately 16 percent (about 500,000) items are disposed of through reutilization, 25 percent are sold, and the remaining ones are either downgraded to scrap and sold, abandoned, or destroyed.

### F.1 Item Visibility.

A major objective of the reutilization function is item (asset) visibility to achieve the most cost-effective utilization of excess/surplus materiel. The DRMOs should be major sources of supply for DoD retail customers and a source of replenishment for wholesale IMs. The reutilization function has a series of standardized, automated procedures for wide dissemination of descriptive information on its available assets. Manual lists are also disseminated on a weekly basis to approximately 5,000 customers.

FIGURE F-12. DEFENSE REUTILIZATION AND MARKETING FUNCTIONS




An on-line Interrogation Requirements Information System (IRIS) covering the full spectrum of items currently available greatly improves this process and raises the level of materiel and equipment reutilization.

**TABLE F-10. DESCRIPTIONS: REUTILIZATION AND MARKETING FUNCTIONS**

| FUNCTIONS | DEFINITIONS |
|---|---|
| 6.0 Reutilization and Marketing | The logistics processes associated with receipt, classification, storage, reutilization, sale, or disposal of property excess to supply requirements |
| 6.1 Item Visibility | The electronic visibility of materiel assets declared excess within the DoD supply system, including such pertinent information as quantity, location, condition, and similar data as is necessary to fully describe the materiel to a potential requisitioner |
| 6.2 Reutilization | The process that ensures that excesses from one DoD Component are screened and utilized to the fullest extent practicable by other DoD Components or other Federal agencies. Screening activities take into account the cost of packaging, crating, handling, transportation and rehabilitation to preclude uneconomical transfer when compared with the cost and leadtime involved in new procurement |
| 6.3 Sale | If excess materiel cannot be reused within DoD or other governmental or nonprofit organizations, the residual is sold. Sales and merchandising responsibility rests with the Defense Reutilization and Marketing Regions. Those regions receive reports of assets located in various DRMOs, maintain property accountability, determine types of sales to be conducted and handle merchandising response |
| 6.4 Scrap and Waste | When property is not utilized, donated, or sold, it may be offered as scrap and waste materiel at public sale to the highest bidder. These are national auctions for large quantities of accumulated scrap |

F.2 Reutilization.

Reutilization of assets requires close cooperation with IMs and procurement activities. To maximize reutilization opportunities for IMs and procurement, the DRMS inventory is available through on-line access. The files are checked before procurement of new stock begins.

F.3 Sale.

A recognized problem in the sale process is accurate and timely reporting of the condition of an asset. DRMS assets are normally retained for 6 months and in some instances, a year. The published lists of available items consist of descriptions and the NSN when it is known. Another problem is that the condition of an item may change over time, and the condition code is not easily updated in current systems. Again, asset visibility is an important factor in obtaining the best sale price.

F.4 Scrap and Waste.

If no useful purpose can be found for an item, it is downgraded to scrap, and the scrap is disposed of through sales or service contracts. This process requires maintenance of auditable accounting records. Standard procedures for various types of items (classified, hazardous) must be carefully followed and reported through standard transactions.

F.5 Disposal Automation.

Much of the automation to provide on-line access to excess/surplus items is already in progress through the DAISY project. The DRMS function and its DAISY project are the responsibility of DLA. Since the DRMS function is an integral DoD-wide logistics activity with multiple DLSS interfaces, close coordination must be maintained between the DAISY project office and the MODELS project office. Because of the integrated relationships between many DRMS and DLSS functions, OSD should consider a closer working relationship between the responsible organizations.

> *MODELS Requirement:* The MODELS concept must recognize the integral role of DRMS in the total logistics process and should interface into the MODELS conceptual design an evolving DAISY capability for on-line visibility of excess assets. Asset visibility should be available to wholesale IMs and all retail-level supply echelons. OSD should consider the integration of DRMS functional procedures into the DLSS scope of responsibility.

## CHAPTER G. SUMMARY OF PART I MODELS REQUIREMENTS

The previous six chapters presented more than 60 data exchange and logistics functional requirements to be incorporated into modernized, expanded DLSS and to improve information exchange, through the use of modern communications techniques and technologies.

To assist in reviewing the magnitude of these requirements, this chapter presents all the Part I requirements in a sequential list. The section title for the requirement is listed along with the page number in the text to facilitate referral to the rationale for a specific requirement.

### A. SCOPE OF THE MODERNIZED DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL ACTIVITIES.

*MODELS Requirement:* Informational inputs and function-to-function interfaces (for example, supply-to-transportation) should be reevaluated and redefined to overcome known inter-S/A information deficiencies not addressed by the current DLSS and to meet the needs of new and expanding functional and management information requirements. (Part I, Chapter A, page I-6)

#### A.1 DLSS Transactions and Data Exchange Considerations.

*MODELS Requirement:* The MODELS conceptual design must provide flexible transaction formats and a methodology for expedited adoption of new codes and procedures as logistics operations and management information needs change. (This characteristic is discussed in more detail in Part II, Section B.2) (Part I, Chapter A, Section A.1, page I-8)

*MODELS Requirement:* UMMIPS performance measurement standards and procedures should become part of the restructured, expanded DLSS, and must continue to be closely coordinated with the Joint Chiefs of Staff (JCS) for FAD and priority assignments. (This requirement is discussed in more detail in Part I, Chapter C.) (Part I, Chapter A, Section A.1, page I-8)

*MODELS Requirement:* MODELS will require some degree of data base and data model standardization. (Part I, Chapter A, Section A.1, page I-9)

*MODELS Requirement:* The MODELS concept must provide the capability for internal S/A-unique data needs to be accommodated in DLSS inter-S/A transactions. (Part I, Chapter A, Section A.1, page I-10)

*MODELS Requirement:* MODELS transaction formats must provide flexibility to handle two-party and multi-party informational exchanges, even though not formally part of DLSS procedures. (Part I, Chapter A, Section A.1, page I-11)

*MODELS Requirement:* A standard DoD logistics data elements dictionary will be a requisite (and a responsibility of the DLSS); it will have to include all data elements, terms, and definitions used in S/A logistics system interfaces and information exchanges. The basis for this dictionary should be LOGDESMAP. (Part I, Chapter A, Section A.1, page I-11)

A.2 Requirements Drivers.

*MODELS Requirement:* Modernized DLSS must provide for standardization of retail procedures. (Part I, Chapter A, Section A.2, page I-12)

*MODELS Requirement:* The MODELS concept must coordinate with all S/A logistics modernization requirements. It must also be able to satisfy logistics information requirements and fully support resupply requirements in crisis or wartime situations. (Part I, Chapter A, Section A.2, page I-13)

A.3 Logistics Interfaces.

*MODELS Requirement:* The MODELS conceptual design should accommodate all information exchanges between inter-S/A logistics functions and operational/management components. (Part I, Chapter A, Section A.3, page I-13)

## B. PERFORMANCE MEASUREMENT FUNCTIONAL REQUIREMENTS.

*MODELS Requirement:* The MODELS concept should include the capability to (1) accumulate performance characteristic data generated as a normal process of daily operations, and (2) provide for the retrieval of performance data in a form that the intended recipient will find most useful. This capability should include collection of data, based on normally generated operations data (not special data collection efforts), and rapid retrieval in easily modified formats, to view information from different points of interest. (Part I, Chapter B, page I-16)

### B.1 Retail Inventory Management.

*MODELS Requirement:* The MODELS concept should include methods for collecting and reporting data at the retail operations level to satisfy a variety of performance measurement criteria. (Part I, Chapter B, Section B.1, page I-17)

### B.2 Wholesale Inventory Management.

*MODELS Requirement:* The MODELS concept design should make it easy to measure the performance of a range of operations and trend indicators at the wholesale operations level. (Part I, Chapter B, Section B.2, page I-23)

### B.3 Pipeline Performance.

*MODELS Requirement:* The MODELS concept should identify methods and procedures to collect pipeline performance measurement data at each segment of the process as it occurs. The DLSS should standardize the definition of each pipeline segment. (Part I, Chapter B, Section B.3, page I-24)

*MODELS Requirement:* The MODELS concept must have the capability to electronically collect, collate, and summarize discrepancy reports from all S/A organizations worldwide as one element of performance measurement reporting. These discrepancy reporting evaluation procedures should be incorporated into DoD-wide standard performance measures. (Part I, Chapter B, Section B.3, page I-24)

B.4 Contracting.

*MODELS Requirement:* The DLSS should develop standard criteria for measuring procurement and contracting performance. The MODELS concept must include procedures to collect these standardized performance measurement data as a normal function of procurement and contract administration process information flows. (Part I, Chapter B, Section B.4, page I-26)

B.5 Interfund Billing.

*MODELS Requirement:* The MODELS concept should include the development of methods toward modernizing the capability to accomplish the interfund billing procedures without the current cost. (Part I, Chapter B, Section B.6, page I-26)

B.6 Weapons System Management.

*MODELS Requirement:* Modernized DLSS procedures must define a standard weapons system performance measurement program, including standardized weapons system identification codes in all applicable transactions. The DLSS procedures must allow for multiple weapons system coding for common-use items. The MODELS design must provide the automated capabilities to perform weapons system-oriented performance measurement of logistics operations. This must include access by weapons system relationships to wholesale and retail operational performance measurement data. (Part I, Chapter B, Section B.6, page I-28)

*MODELS Requirement:* A comprehensive set of logistics operations performance measurements should be developed and implemented through a DLSS procedural publication. (Part I, Chapter B, Section B.6, page I-29)

## C. ACQUISITION FUNCTIONAL REQUIREMENTS.

C.1 Procurement Activities.

*MODELS Requirement:* The modernized DLSS procedures should encompass standard procurement functions, contract modifications, and related inter-S/A information exchange requirements. (Part I, Chapter C, Section C.1, page I-35)

C.2 <u>Contract Administration Activities</u>.

C.2.a. <u>MILSCAP Transactions</u>.

*MODELS Requirement:* MODELS acquisition function transaction formats must be variable in length to accommodate all S/A contract data exchange requirements. All procurement and contract-related information should be available electronically. (Part I, Chapter C, Section C.2.a, page I-37)

C.2.c. <u>Technical Administration</u>.

*MODELS Requirement:* The MODELS concept must provide access to contract data via various data elements and also establish and maintain relationships among data elements through a well-designed data architecture. (Part I, Chapter C, Section C.2.c, page I-38)

C.2.e. <u>Quality Assurance</u>.

*MODELS Requirement:* CDRs should become a part of ACO/PCO data bases and should be available on-line. (Part I, Chapter C, Section C.2.e, page I-39)

C.3 <u>Technical Data Acquisition</u>.

*MODELS Requirement:* The MODELS effort should continue to closely monitor CALS developments and information exchange protocols and procedures. As standards are developed by the OSD-CALS Group for technical data acquisition and distribution procedures and communications interfaces, these standards should be published as part of the modernized DLSS technical data functions discussed here and in Part I, Section D.3. (Part I, Chapter C, Section C.3, page I-40)

## D. SUPPLY FUNCTIONAL REQUIREMENTS.

D.1 <u>Retail Requisitioning</u>.

D.1.a <u>Requisitions</u>.

*MODELS Requirement:* Retail requisitioning should be DLSS compatible throughout the S/A logistics community. DLSS procedures should standardize the requisitioning transaction to accommodate retail-level end-user requirements. (Part I, Chapter D, Section D.1.a, page I-48)

D.1.b Pipeline Status – Inquiry and Response.

*MODELS Requirement:* The MODELS concept should provide retail users with direct, on-line access to retail supply echelons within their supply issue hierarchy and then to the wholesale logistics systems for inquiries about stock availability, identification of retail-issue requisition demand and shipment actions. (Part I, Chapter D, Section D.1.b, page I-49)

D.1.c Receipt Take-Up and Acknowledgment.

*MODELS Requirement:* The MODELS concept must recognize the usefulness of bar coding for the receipt take-up and acknowledgment process and must include DLSS procedures for accessing due-in posted data, using bar-coding techniques, with automated receipt posting and reporting. (Part I, Chapter D, Section D.1.c, page I-49)

D.1.d Discrepancy Reporting and Processing.

*MODELS Requirement:* The MODELS implementation should encourage automating all types of discrepancy/deficiency recordkeeping and propose procedures for automated response and disposition instruction processing, in accordance with integrated standards published in modernized DLSS procedures. (Part I, Chapter D, Section D.1.d, page I-50)

D.1.e Excess Reporting and Reutilization.

*MODELS Requirement:* The modernized, expanded DLSS should standardize processing of materiel and equipment to DRMO's, including all types of local turn-ins. The automated processing of materiel to R&M functions, even for local turn-ins, should be interfaced with MODELS implementation. (Part I, Chapter D, Section D.1.e, page I-51)

D.1.f Shipments.

*MODELS Requirement:* Procedures for all retail shipment preparation and documentation should be incorporated into the modernized DLSS. (Part I, Chapter D, Section D.1.f, page I-51)

D.2 Wholesale Inventory Management.

D.2.a Requirements Computation and Acquisition.

*MODELS Requirement:* The expanded DLSS must develop DoD standards for analysis of demand and presentation of requirements data, including initial provisioning procedures and the control and management of war reserve materiel requirements. (Part I, Chapter D, Section D.2.a, page I-56)

D.2.b Cataloging.

*MODELS Requirement:* The MODELS concept should review DIDS modernization requirements and plans and closely coordinate the MODELS conceptual design to accommodate future DIDS capabilities. (Part I, Chapter D, Section D.2.b, page I-57)

D.2.c Inventory Control.

*MODELS Requirement:* All inventory management and control issues and procedures should be integrated in an expanded DLSS. Within this integrated environment, the MODELS design must provide the IMM the capability for on-line DoD-wide asset visibility. (Part I, Chapter D, Section D.2.c, page I-58)

D.2.d Distribution and Redistribution.

*MODELS Requirement:* Distribution and redistribution procedures should be consolidated under one expanded DLSS procedure for wholesale supply management. (Part I, Chapter D, Section D.2.d, page I-59)

D.2.e Repair and/or Rebuild.

*MODELS Requirement:* The MODELS concept must provide an automated information interface for maintenance requirements. The modernized DLSS must provide for the induction and return of reparables, so that the IMM/IM (owning) has the necessary asset visibility to allow for proper control, and to take asset status into consideration when performing procurements and redistributions. (Part I, Chapter D, Section D.2.e, page I-60)

D.2.f Requisition Processing.

*MODELS Requirement:* Requisition history retention periods for each type of transaction should be standardized. Visibility of referrals, backorders, depot denials, and cancellations should be enhanced. (Part I, Chapter D, Section D.2.f, page I-60)

*MODELS Requirement:* The MODELS concept must provide for correct response of the logistics system to JCS and Unified Command allocation guidance. (Part I, Chapter D, Section D.2.f, page I-60).

*MODELS Requirement:* The use of priority codes, project codes, and weapons system codes in the requisition transaction must be defined and accommodated in the MODELS concept. Requisition edits by the supply source and intervening third parties (such as DAAS) need to be integrated under the DLSS. (Part I, Chapter D, Section D.2.f(1), page I-61)

*MODELS Requirement:* MODELS should provide a better approach to accessing source-of-supply information and to resolving conflicts. (Part I, Chapter D, Section D.2.f(2), page I-61)

*MODELS Requirement:* MODELS must establish standards for methods of supply determination processes to assure responsive support of user requirements. (Part I, Chapter D, Section D.2.f(3), page I-61)

*MODELS Requirement:* The MODELS concept should include a method for providing denial status directly to requisitioners either at a retail-supply point or through the retail-supply point system to end-user requisitioners. Standardized procedures and time frames are needed to improve data retention for depot records and for the use of constructive delivery-and-receipt concepts for billing purposes throughout all levels of the logistics community. (Part I, Chapter D, Section D.2.f(4), page I-62)

*MODELS Requirement:* MODELS should evaluate the continuing need for pushed follow-ups, especially to update centralized data bases maintained by the S/As, if interactive inquiry gateway capability is established throughout the logistics system network. This change would require that standardized procedures and guidelines be promulgated for inquiry capability. (Part I, Chapter D, Section D.2.f(5), page I-63)

*MODELS Requirement:* MODELS must incorporate improved interface capabilities to permit timely processing of modifications and cancellations. Also, modernized DLSS must include procedures and standard rules concerning the stages at which changes can be made (during which segments of the pipeline process), what changes are authorized with various modes of data access (interactive versus transactional), and who is authorized to initiate interactive changes, taking appropriate precautions on access and record-level security. (Part I, Chapter D, Section D.2.f(7), page I-64)

*MODELS Requirement:* DLSS guidelines and procedures for processing backorder releases need to be developed and implemented. A priority processing scheme similar to that used for in-process requisitions should be applied to backorder release processing. Partial shipments of priority materiel should be considered, and rules and automated procedures should be developed to standardize when such shipments can be authorized and by whom. (Part I, Chapter D, Section D.2.f(8), page I-65)

D.2.g Retail Excess Processing (Returns).

*MODELS Requirement:* MODELS must improve IM visibility of retail excess materiel. Also, the DLSS should identify procedures to integrate retail returns with discrepancy processing systems. (Part I, Chapter D, Section D.2.g, page I-65)

D.2.h Wholesale Excessing.

*MODELS Requirement:* Procedures for ICP determination and processing of wholesale excess materiel need improvement. (Part I, Chapter D, Section D.2.h, page I-66)

D.2.i Discrepancies.

*MODELS Requirement:* The DLSS should define a standard set of reporting procedures for all types of discrepancies, in one procedural document. The MODELS concept should consider methods for automated integration of deficiency reporting procedures through data base techniques and on-line, interactive information retrieval capabilities. (Part I, Chapter D, Section D.2.i, page I-67)

D.3 Technical Data Management.

D.3.a Use and Management of Technical Data.

*MODELS Requirement:* DLSS procedures need to be developed to define standards for the use and transmission of technical data. The MODELS design must allow and promote on-line access to catalog and technical data, with full graphics capability for transmission and display of digitized images. This capability must incorporate CALS-developed procedure and protocol standards as discussed in Part I, Section C.3. (Part I, Chapter D, Section D.3.a, page I-68)

*MODELS Requirement:* The MODELS concept should provide for standardization of procedures for the exchange of technical data between the S/As. (Part I, Chapter D, Section D.3.a, page I-70)

D.3.b Cataloging.

*MODELS Requirement:* The DLSS must provide for standardization of cataloging activities related to technical data, engineering drawings, and documents, in accordance with the OSD-CALS Group recommendations. (Part I, Chapter D, Section D.3.b, page I-70)

D.3.c Storage and Retrieval.

*MODELS Requirement:* The DLSS should incorporate the findings and recommendations of the CALS project for technical data storage and retrieval standardized procedures. (Part I, Chapter D, Section D.3.c, page I-72)

D.4 Wholesale Storage.

D.4.a. Receipt.

*MODELS Requirement:* Wholesale receipt procedures for information access and exchange between the depot and ICP should be fully covered under the modernized DLSS, including use of bar-coding technology, interface requirements to other logistics functions, and performance measurement/quality control processes. (Part I, Chapter D, Section D.4.a, page I-74)

D.4.b. Warehousing (Depot Operations).

*MODELS Requirement:* Modernized DLSS should integrate DoD 4140.27-M for shelf-life items and hazardous materiel procedures into an expanded wholesale storage standard. (Part I, Chapter D, Section D.4.b, page I-76)

D.4.c. Physical Inventory.

*MODELS Requirement:* The MODELS concept must include automated processes to accommodate and improve the productivity of conducting these procedures. Bar-coding technology must be accommodated for conducting physical inventory counts and location surveys. (Part I, Chapter D, Section D.4.c, page I-77)

D.4.d. Issue.

*MODELS Requirement:* The MODELS concept must accommodate improved automated information exchange for issue procedures between the depot and ICP, as new technologies such as bar-code readers are introduced into depot issue processing. (Part I, Chapter D, Section D.4.d, page I-78)

D.4.e. Shipment Preparation.

*MODELS Requirement:* Shipment preparation procedures should all be integrated in modernized DLSS procedures. The MODELS concept must be able to accommodate the full extent of information exchange requirements dictated by integrated procedures. The MODELS concept must also allow for and encourage the use of bar coding and EBDI standards for improved documentation and processing efficiency. (Part I, Chapter D, Section D.4.e, page I-78)

## E. TRANSPORTATION FUNCTIONAL REQUIREMENTS.

*MODELS Requirement:* The MODELS concept must provide for a more comprehensive exchange of transportation information/data with all logistics community activities and also some activities that are not included in the defense logistics operations/management environment, particularly JCS, Joint Deployment Agency (JDA), and the Commanders-in-Chief (CINCs). (Part I, Chapter E, page I-81)

*MODELS Requirement:* The MODELS concept must provide for a reduction of paperwork and must improve the flow of compatible data, on a near-real-time basis in some cases, within the defense transportation function and to and from other organizations, including commercial carriers. EBDI concepts and standards must be incorporated. (This topic is discussed in detail in Part II, Section B.2.) (Part I, Chapter E, page I-86)

*MODELS Requirement:* The DLSS-expanded functions must provide for evaluation and development of procedures and data exchange requirements in theaters of operation, compatible with the DTS and CONUS-based activities that provide transportation data to the theater or require data from the theater. (Part I, Chapter E, page I-86)

*MODELS Requirement:* The MODELS concept must provide for evolutionary development of a near-real-time capability to provide information and data to assist MTMC in managing the transportation function in support of logistics activities. (Part I, Chapter E, page I-86)

E.2 Traffic Management.

*MODELS Requirement:* The MODELS concept must provide for continuing improvements in the exchange of data between activities engaged in the authorization decision process and the traffic management function. (Part I, Chapter E, Section E.2, page I-87)

*MODELS Requirement:* The MODELS concept must provide for a reasonable interchange of information and data between transportation activities and both nontransportation and nonlogistics activities. (Part I, Chapter E, Section E.2, page I-88)

E.3 Movement.

*MODELS Requirement:* The MODELS concept must provide for improving existing capabilities for recording and reporting of transportation movement information and data. (Part I, Chapter E, Section E.3, page I-89)

## F. REUTILIZATION AND MARKETING.

F.5 Disposal Automation.

> *MODELS Requirement:* The MODELS concept must recognize the integral role of DRMS in the total logistics process and should interface into the MODELS conceptual design an evolving DAISY capability for on-line visibility of excess assets. Asset visibility should be available to wholesale IMs and all retail-level supply echelons. OSD should consider the integration of DRMS functional procedures into the DLSS scope of responsibility. (Part I, Chapter F, Section F.5, page I-94)

In summary, these functional requirements define how the next generation of DLSS should be organized and implemented. Improved logistics management and the future effectiveness of the Military Departments are greatly dependent on the efficient and uniform interchange of the logistics information that is vital to the ability of U.S. forces to accomplish their assigned missions anywhere in the world for as long as it takes to get the job done.

We can expect to have the right materiel where it is needed, when it is needed only if we take the comprehensive view of the complete logistics process and all its complex interrelationships that is necessary to identify, acquire, supply, transport, maintain, and reuse, when necessary, military end items, support equipment, and spare parts. While the system has worked and continues to work, meeting the requirements stated herein should enable the DoD logistics community to achieve significant gains in productivity, timeliness, accuracy, information consistency, and information accessibility.

The next part of this report, Part II, Operational Requirements and Considerations, discusses user interface and automated information exchange requirements and methodologies.

# PART II: MODELS – OPERATIONAL REQUIREMENTS AND CONSIDERATIONS

# CHAPTER A: LOGISTICS SYSTEMS USER REQUIREMENTS

The Department of Defense (DoD) logistics community, along with every other functional community in DoD, is in the midst of an explosion in information technology. That technological explosion requires emphasis on information management as new opportunities and capabilities are available to improve decision-making at every management level. Today, DoD organizations are fielding more than 30[1] major logistics information processing and telecommunications systems designed to assist catalogers, item managers, supply officers, transportation officers, combat commanders and their staffs, and others to accomplish their jobs more effectively. Unless those systems can satisfy the intended user's needs by providing the right information at the right time, the potential for improved DoD-wide logistics management and responsiveness to operational requirements will not be fully realized.

This chapter describes the functional requirements for user interfaces. It specifically discusses information exchange requirements that address inter-Service/Agency (S/A) and Service-to-Joint Activities requirements.

## A.1 Information Exchange Requirements.

Logistics operations can no longer be performed solely on an intra-Service basis. Even the Army, with its Logistics Intelligence File (LIF), must rely heavily upon Defense Logistics Agency (DLA)/Defense Automatic Addressing System (DAAS) telecommunication capabilities for the transmission of information, upon inventory control point (ICP) and depot systems for information on supply

[1]DoD Appropriations 1986, Hearings before the Subcommittee on the Department of Defense of the Committee on Appropriations, House of Representatives, 99th Congress, Part 6 – *Automatic Data Processing Programs*.

availability, release, and shipment, and upon Military Traffic Management Command (MTMC)/Military Sealift Command (MSC)/Military Airlift Command (MAC) systems for in-transit shipping status information. With the advent of weapons system-oriented logistics management, secondary asset visibility to the retail level, and increased emphasis on standardization, competition, and excess item reutilization, the need for up-to-date exchange of information between S/As becomes a critical requirement that must be satisfied in new systems and procedures now under development.

All the S/As recognize the critical need for improved standardization in their own internal logistics procedures and systems interfaces. Each S/A's system development effort [i.e., the Army's Commodity Command Standard System (CCSS); the Navy's Stock Point ADP[2] Replacement (SPAR) system; the Air Force's Stock Control and Distribution (SC&D) system; the Marine Corps' Standard Supply System (M3S); and DLA's Standard Automated Materiel Management System (SAMMS)] is directed at incorporating its own unique data element dictionaries, thereby establishing a set of logistics data elements and data definitions to be utilized throughout its specific environment. Similarly, most of the S/As are implementing high-speed telecommunications networking capabilities [Navy's Stock Point Logistics Integrated Communications Environment (SPLICE); Air Force's Logistics Network (LOGNET); Marine Corps' Data Network (MCDN); and Defense Logistics Agency Telecommunications Network (DLANET)] between their own Service's logistics facilities to speed the communication of information electronically, thereby reducing paper flow and improving supply availability and responsiveness. (*Note:* many of these telecommunications network capabilities are scheduled to be integrated into the Defense Data Network (DDN) in the next 5 to

[2]ADP (Automatic Data Processing).

10 years.) However, most inter-S/A transactions now require DAAS to support their communications, and the only common inter-S/A data element dictionary for logistics is defined by the Defense Logistics Standard Systems (DLSS) procedures.

One objective of Phase 2 of the MOdernization of DEfense Logistics Standard Systems (MODELS) project is to identify and define *inter-S/A* system interface requirements to better satisfy the need for logistics information exchange and improve overall operational capability. (See Part II, Sections B.4 and B.5 for MODELS Requirements for system interoperability.)

A.2 Inter-S/A Interface Requirements.

Many of the inter-S/A logistics communication requirements originate from the Services and are related to the requirement for item requisition status for DLA, the General Services Administration (GSA), or Service managed and maintained materiel. That requirement is primarily satisfied by communications from origin to destination through DAAS using the Automatic Digital Network (AUTODIN) and standard Military Standard Requisitioning and Issue Procedures (MILSTRIP) follow-up transactions. DLA Centers do provide limited on-line inquiry using terminal connections into DLANET and offering status inquiry capability by National Stock Number (NSN). However, for a period of time, the DLANET became saturated with input ports (i.e., no new users could get onto the network until DLA terminal processors were enhanced with additional processing capability). While that situation was resolved by adding processing capability, the condition will occur again as demand for inquiry access continues to increase. While current users of the DLANET are becoming frustrated with the quality of service (response time and access contention), they continue to request on-line capability while looking for more efficient methods of logistics information access. The current best alternative is the MILSTRIP follow-up transaction, but the most frequently used alternative, at least for Priority Group I requisitions, is a telephone call to the DLA source-of-supply.

In interviews, retail-level equipment maintenance and repair personnel indicate their desire for on-line requisition processing for Priority Group I materiel and almost immediate confirmation of stock availability and shipment date. That information is needed for repairing weapons systems whose repairs are delayed because not mission capable supply (NMCS) requisitioned materiel is not received.

> *MODELS Requirement:* The MODELS concept should provide the capability to implement on-line user interfaces with ICPs for stock availability and requisition status inquiry for, as a minimum, Priority Group I materiel requirements.

Another area of DLA operations having substantial volumes of inter-S/A interface is the Defense Contract Administration Service (DCAS). DCAS Administrative Contracting Officers (ACOs) in contractor plants and DCAS offices in nine regions of the United States are responsible for carrying out materiel quality assurance programs, monitoring production schedules, and performing data and financial management activities. Information obtained from contractors and maintained by the ACOs is needed by DLA and Service ICPs, depots, and end-users. That information includes production quantities, anticipated shipment and shipment dates, contract requirements and special provisions, and similar data. Any changes in production or shipment information may be of vital interest to the entire set of DoD potential users since it can affect reorder quantities, safety stocks, and maintenance and repair decisions.

These contract information requirements include contracts and purchase orders awarded and administered by other S/A acquisition and contract administration activities.

> *MODELS Requirement:* The MODELS concept must provide a broad base of DoD users with access (not necessarily in real time) to data from contracting and contract administration activities that maintain information related to contract content and status. (Correlates to MODELS Requirement – Part I, Chapter C, Section C.2.c, page I-38.)

## A.3 Interface Requirements of the Defense Transportation Function.

The Defense transportation function is the composite infrastructure of all the DoD organizations responsible for the movement of people, their personal effects, and most military materiel. The system manages the movement of materiel by truck, rail, ship, barge, and air, and many of these movements are performed by commercial carriers. Those carriers, in increasing numbers, are developing the capability to provide near-real-time shipment-in-transit-movement visibility, information that has been of interest to both shippers and receivers for many years. However, shipment movement information and specific-item movement status provide distinctly different levels of information availability. While a Government Bill of Lading (GBL) or shipping manifest will contain freight descriptions and other transportation information, the carrier does not generally know the contents of a package, if multiple items have been consolidated (except in the case of hazardous or specially controlled items). For item-level information within a shipment unit, the inquiry must still be referred to the originating supply or transportation shipping activity.

The first step in providing shipment visibility within the transportation system should be electronic information interfaces between Defense Transportation System (DTS) carriers and the transportation movement managers. That information is already available in some systems, such as the Air Force's Aerial Port Documentation and Management (ADAM III) system for air shipments. The second step is implementation of electronic interfaces between commercial carriers and traffic managers for Continental United States (CONUS) surface shipping.

*MODELS Requirement:* DLSS procedures must provide for meeting the growing need for inter-S/A standardization of information to be collected and electronically communicated between DoD transportation agencies and customers and, between DoD and commercial transportation activities. (Correlates to MODELS Requirement – Part I, Chapter E, Section E.3, page I-89.)

A.4 Service-to-Service Interface Requirements.

Currently, a good example of a major Service-to-Service interface requirement is the requisitioning, shipment, and receipt of ammunition. The Army, as the Single Manager for Conventional Ammunition, provides conventional ammunition logistics support, and therefore logistics information, to the entire DoD. While ammunition is unlike any other commodity in that it is a high-dollar commodity characterized by high volume and tonnages involving many different types of ammunition that require special handling and storage and detailed tracing and accountability records, the systems used to manage the process may have a broader applicability in design if not in exact implementation.

In compliance with Department of Defense Directive (DoDD) 5160.65, which requires the Army to develop, design, and centrally maintain a DoD-wide automated data system covering the logistics functions in their Single Manager for Conventional Ammunition assignment, the Army is implementing a Defense Standard Ammunition Computer System. The system, which is envisioned as a centrally-located pair of processors at Rock Island, Illinois, will consist of two data bases of ammunition relevant information networked to other Service systems supporting ammunition-related logistics functions. The system will then standardize and control all conventional ammunition acquisition, logistics, and financial processes. The completed system is scheduled to be deployed during Fiscal Years 1989 and 1990 and will provide other Service ammunition managers on-line access to a full range of logistics information required for decision-making. This Service-to-Service interface

requirement is already extending beyond ammunition, as additional weapons systems (e.g., Air Force and Navy F-4 aircraft) and weapons system spare parts are used by multiple Services.

> *MODELS Requirement:* Modernized DLSS procedures and the MODELS information exchange technology concepts must provide standardized interfaces to unique commodity systems (e.g., ammunition, petroleum). Eventually such unique Service-to-Service and Service-to-DLA procedures and automated systems must be fully integrated into the MODELS concept.

### A.5 Joint Chiefs of Staff (JCS) Mobilization Interface Requirements to the Logistics System.

Since the reorganization of the nation's military establishment into the DoD after World War II, the roles of the Office of the Secretary of Defense (OSD), JCS, Commanders-in-Chief (CINCs), Defense and Joint Agencies, and the Military Departments have evolved as each element of the DoD has striven to improve its capability to participate in defending the nation and to support its fighting forces in a deployed military action (as this is being written, reorganization of the JCS to strengthen its role is being considered). Of primary concern to all is accomplishing this mission within the constraints of budgetary limitations.

The evolutionary development of DoD has taken two paths. On the one hand, OSD has tried to increase logistics support efficiency and reduce costs. On the other hand, the JCS, CINCs, and Joint Agencies have concentrated on planning for war and its contingencies and on force readiness. The Services have participated in both evolutionary processes, their contributions being limited to some degree by their traditional ways of doing business. This somewhat uneasy dichotomy between the responsibility for the preparation of combat forces and the responsibility for preparing the plans to fight the war contributes to the lack of coordination between the two arenas.

Traditionally systems development in the Joint-Agency arena has been in the planning area. However, over the past few years (since the NIFTY NUGGET – 78 exercise) increasing emphasis has been placed on developing decision support systems for executing war plans. One of the actions taken was establishment of the Joint Deployment Agency (JDA). Its mission is to "act as the focal point for deployment associated decision-making information" and to "adjust movement plans, schedules, and modes of transportation and direct implementation of deployment decisions." That includes monitoring of resupply cargo to facilitate lift allocation decisions and facilitating prioritization of critical resupply movements.

The Joint Deployment System (JDS) is a component of the evolving Joint Operations, Planning, and Execution System (JOPES), being developed by JCS. That system is vitally interested in the initial movement of units and equipment/material and their subsequent sustainment (i.e., the logistics process). Therefore, the JDA components responsible for JDS are very interested in monitoring the development and implementation strategies of the MODELS concept. Modernization of the DLSS could be a key factor in the development of both deployment and sustainment capabilities in JDS.

In addressing sustainment, the primary objectives of JOPES are to compare wartime requirements to available assets to determine feasibility and to allocate assets among competing requirements on a global basis. To meet these objectives, MODELS must provide JCS/CINC visibility of system inventories and must accept and implement JCS allocation guidance to ration available stocks among competing claimants.

One problem being addressed in JOPES/JDS is that of allocation and reallocation of critical supply and transportation assets during a crisis or in wartime. The problem exists because there is no common basis for communication between

planning personnel and operations personnel to express planned supply requirements in terms that can be executed. Military plans define supply requirements in terms of 10 classes and several subdivisions of these classes. In the operational world, supplies are identified in 78 groups, 619 classes, and several million NSNs. The problem is further compounded by the differences between supply and transportation requirements, with supply centering on and using requisition number and NSN and transportation centering on and using the Transportation Control Number (TCN). The recently approved use of the Federal Supply Class (FSC) to be transmitted in the Advance Transportation Control and Movement Data (ATCMD) for MAC shipments addresses part of the problem of requisition tracking between supply and transportation. The DLSS could make further major contributions to the overall supply-transportation-JOPES integration effort by providing a structure for better resolution of this supply-transportation problem. At present, procedures developed by the Joint Agencies have not evolved to the extent that specific functional requirements can be identified in detail for MODELS. The evolving JOPES (including the JDS), along with S/A system modernization projects [many of which are indirectly providing information to the Worldwide Military Command and Control System (WWMCCS) Information System program], and MODELS appear to be logical approaches to integrating logistics planning and execution solutions.

> *MODELS Requirement:* The MODELS concept should provide for a working interface between joint operations systems and the DLSS. (Correlates to MODELS Requirement – Part I, Chapter E, page I-81.)

# CHAPTER B: METHODS OF LOGISTICS INFORMATION EXCHANGE

Rapidly developing technologies in data processing, telecommunications, information management, and related information processing/dissemination fields have created a broad-based demand for change to incorporate these new capabilities into all aspects of defense operations, including logistics management. These new capabilities in turn offer opportunities to achieve significant advances in providing users with the information needed, in the report format needed, and at the time needed to make better management decisions.

The following pages discuss emerging technologies that should be incorporated into the MODELS system concept to effectively meet today's and tomorrow's logistics management requirements.

## B.1 Data Standardization.

Data and information are not synonymous. Information is assembled from data in the same way products are assembled from inventory. Because organizations rarely agree on the data they will use to build their information, many different combinations and permutations of data are used to create the desired information.

Data is facts plus meanings. Without meanings, facts are just jumbles and strings of symbols. To establish control over data meanings, a data resource manager must establish a set of data standards, and those standards must be based on an organization-wide consensus of the meanings of all terms that define facts. Data standards control what data will be put on the organization's computers and used by employees to create the information required to run the organization's operations.

Data standards are data elements and their associated meanings established by management to control the use and application of the specified data elements. The DoD Logistics Data Element Standardization and Management Program

(LOGDESMAP) is chartered to provide a common base of standard logistics data elements and related features for use throughout DoD logistics systems. This common base will eliminate duplication in logistics data systems and will facilitate the interchange of data between and among such systems. Thus, it is an important component and building block in the MODELS implementation.

> *MODELS Requirement:* The expanded-DLSS procedures must provide for the identification, definition, control, and dissemination of data standards. This role should include the development of data dictionaries. (Correlates to MODELS Requirement – Part I, Chapter A, Section A.1, page I-9.)

B.2 Variable-Length/Variable-Field Transaction Records.

A major information processing and communication restriction continually cited at Congressional hearings and Major Automated Information System Review Council (MAISRC) reviews, in system modernization plans, and in conversations concerning obsolete data techniques is the use of the "80-column card format" for logistics system transactions. This technique is obsolete and inhibits comprehensive, effective information communication. Since all of the Services and DLA are in the process of modernizing their logistics applications, incorporating data base management system (DBMS) technology, implementing Local Area Networks (LANs) and wide area networks, and establishing Defense Communications Agency (DCA)-connecting nodes to the DDN, this is the time to begin implementation of variable-length and variable-field transaction records for inter-S/A communication of logistics information. In fact, that implementation should have already started.

Names of parts and vendor part numbers, organization ship-to and bill-to names and addresses, order quantities, special instructions, contractual information, transportation information (particularly for personal effects), and similar logistics information vary greatly in length. To accommodate the maximum required length without truncation or to transmit only the information needed without sending

blank space is infeasible using a fixed-length record. Therefore, the computer and telecommunications industries have developed and implemented the variable-length record.

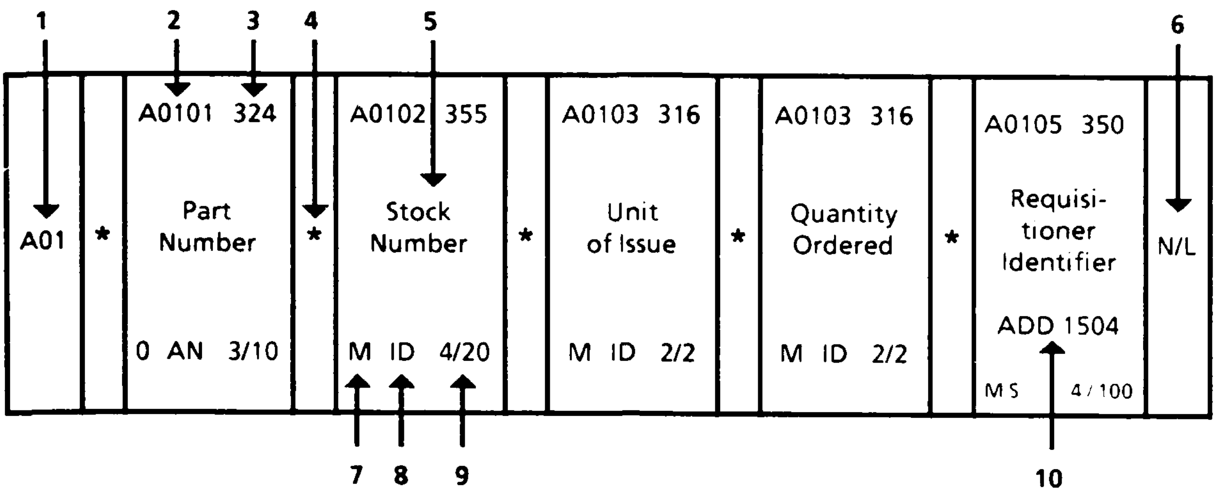
Most character code sets provide a control character that is appropriate to terminate a character string or data segment. The American National Standards Institute (ANSI), specifically the ANSI X12 Electronic Business Data Interchange (EBDI) Standards Committee, has established the '*' as a data element separator and the 'N/L' indicator as the end of a data segment.

Today's information management environment is capable of processing variable-field lengths and variable-field records. Variable-field lengths allow a user to limit the message to the amount of information necessary for the particular situation [i.e., the Department of Defense Activity Address Directory (DoDAAD)-coded address of where materiel is to be shipped], and to transmit all the data necessary in an unusual situation (i.e., a complete station name, if necessary for a special deployment condition).

The variable-field record is a transaction construct designed to permit transmission of the data necessary to fully identify the type of record and the action to be taken. For example, a requisition follow-up status request record might contain only the record type identifier (e.g., requisition follow-up), the requisition number, the source of supply, and a question mark (?) to tell the receiving ICP system, "Send me all the information on this requisition." Both user time in completing the transaction and communication system costs are saved by the variable-length record. A partial, sample transaction record, also known as a data segment, is shown and described in Figure B-1.

**FIGURE B-1. TRANSACTION RECORD/DATA SEGMENT DIAGRAM**

The following diagram illustrates how a transaction record (data segment) is diagrammed and provides references to codes and data elements used in the EBDI Standard. Note that the actual interchange of information does not include all the reference characters shown in the diagram. Only the Data Segment Identifier characters, the values for each Data Element, the Data Element Separator, and the Data Segment Terminator characters are actually transmitted.




(1) **Data Segment Identifier** – The two or three characters assigned to identify the segment (Document Identifier Code).

(2) **Data Element Reference Designator** – The data segment identifier plus a two-digit sequence number.

(3) **Data Dictionary Reference Number** – The index reference number to the Data Dictionary Standard where the content of all data elements is defined.

(4) **Data Element Separator** – The character selected by sender which precedes every data element, whether the data element is used or not.

(5) **Data Element Title** – Name of the data element.

(6) **Data Segment Terminator** – The character selected to end each data segment.

(7) **Data Element Requirement Designator** – Indicates when this element must be included in an electronic document.

M = Mandatory : C = Conditional : O = Optional.

(8) **Data Element Type** – Specifies the characters that may be used

N = Numeric : D = Decimal : AN = Alphanumeric : S = String

ID = Identifier, a specific code taken from a table defined in the Data Dictionary Standard, such as a unit of measure

(9) **Data Element Length** – The minimum and maximum length of the data element in characters.

(10) **Data Element Relational** – Defines relationship between two or more data elements in a group.

A variation of this approach is used by the Defense Logistics Services Center (DLSC) for updating selected data elements in the Defense Integrated Data System (DIDS) data base. A four-digit data element identifier code (as specified in the DIDS data element dictionary) is included in the record followed by a space and the value of the data element. A pound sign (#) is used to separate each identifier code/data value combination. Approximately 85 percent of the updates submitted in this manner are for changes. Forty-five data elements can be added through this transaction type, 65 data elements are subject to change, and 39 data elements can be deleted. Updates in this format can be submitted on 80-column cards or in variable-length formats. These transactions are in addition to and separate from existing fixed-format records.

Thus, the following two variable-length records have to be considered for implementing modernized DLSS transaction formats:

- A variable-length record in which the fields within the transaction record are predefined and if not needed, are omitted by use of a double asterisk (**) set of field delimiters, indicating no data for the designated field.
- A variable-length record in which only a document identifier, field identifier code(s), and associated field value(s) are included in the transaction record.

Both of these transactions have advantages and disadvantages associated with their formats. The first format is better when transmitting initial sets of data such as, for example, an initial requisition. The second format is better when making changes to a transaction already recorded such as, for example, a requisition modifier document. Both alternatives will be evaluated during MODELS, Phase 3.

B.2.a <u>The Variable-Length/Variable-Field Transaction and ANSI X12 EBDI Standards</u>.

The variable-length/variable-field transaction record is gaining wide acceptance in the commercial world for logistics information traffic and other electronic

communications. ANSI, the recognized coordinator and clearinghouse for information on national and international standards, has chartered the X12 committee to develop uniform methods for interindustry electronic interchange of business transactions.

The ANSI X12 EBDI Standards consist of transaction set standards, a data dictionary, and transmission control standards. *Transaction set standards* define the procedural format and data content requirements for business transactions, such as purchase orders. The *data dictionary* defines the precise content and meaning for data elements used in building transaction sets. *Transmission control standards* define the formats for the information required to interchange data. These controls are already in use by some industries, including the grocery industry, representing manufacturers, distributors, and brokers.

Specific EBDI transactions already developed or actively under development are shown in Table B-1. Additional transaction standards are being formulated and

**TABLE B-1. DRAFT PROPOSED ELECTRONIC BUSINESS DATA INTERCHANGE TRANSACTION STANDARDS**

| | | |
|---|---|---|
| Purchase Order[1] | Shipping Notice[2] | Price/Sales Catalog[1] |
| Purchase Order Acknowledgment[1] | Receiving Advice[1] | Request for Quotation[1] |
| Purchase Order Change Request[1] | Invoice[1] | Reply to Request for Quotation[1] |
| Supplier Initiated Purchase Order Change Request[3] | Remittance/Payment Advice[2] | Product Transfer and Resale Report[3] |
| Purchase Order Change Acknowledgment[1] | Account Adjustment[3] | Inventory Advice[3] |
| Order Status Inquiry[3] | Material Safety Data Sheet[4] | Planning Schedule[1] |
| Order Status Report[3] | Waiver Request[4] | |
| Price Authorization Acknowledgment/ Status[3] | Quality Information[4] | |

[1] Proposed standard submitted to ANSI Board for approval

[2] Proposed standard submitted for concurrent and public review

[3] Transactions sets under development

[4] Transaction set areas approved for consideration

sent to the respective industries for review and approval. Recently, in support of the DoD EBDI test for transmission of the GBL, an X12 subcommittee drafted a GBL transaction standard.

Commercial industries supporting and endorsing the EBDI ANSI X12 Standards include retail, manufacturing, electrical, chemical, automotive, aluminum, communications, computer, banking/corporate/finance, and office products. In addition to the ANSI X12 EBDI Standards that cover general business transactions, other ANSI X12 EBDI Standards include:

- Uniform Communications Standard (UCS), primarily used in the retail food business
- Warehouse Information Network Standards (WINS), which facilitate communications in the warehouse industry
- Automated Carrier Interface (designed for ocean carriers), Rail Waybill Interchange (RWI), and Motor Carrier Waybill Interchange (MCWI) used by transportation carriers.

As with several other technologies discussed in this report, the implementation of the standards, becoming commonly known as EBDI, is still very much in its infancy. However, as demonstrated by the number of different industry sectors supporting the concept and a recent EBDI Conference in Washington, D.C. attended by more than 2,500 representatives from the above industry sectors, other industries, and government, the concept is being widely accepted. Thus, in a matter of time, transacting business electronically will probably become a generally accepted method.

The DoD processes millions of business transactions annually with commercial firms. Some of those firms (e.g., General Motors and Johnson & Johnson) are already requiring their suppliers to implement an EBDI capability conforming to the ANSI X12 EBDI Standards. If DoD wishes to continue to foster competition in procurement and reduce its costs of doing business with its vendors, it may need to

endorse, participate in, and implement ANSI X12 EBDI Standards being developed for private-sector logistics functions. Upon such an endorsement, the DoD logistics community must also accept and endorse the variable-length/variable-field records established by the X12 committee standards. Acceptance of these standards implies that a close working relationship will be developed with subcommittees developing standards so that the DoD-specific requirements for conducting business can be incorporated into both existing and developing EBDI standard transaction formats. It also requires acceptance of the ANSI X12 global data dictionary.

Such a DoD acceptance would have a significant impact on DLSS-defined transactions. Every transaction format and every Logistics Data Resource Management System (LOGDRMS)-defined data element would have to be reviewed and revised as necessary to conform to jointly-developed ANSI X12 EBDI Standards. Those reviews and revisions will not be quick, easy, or inexpensive. However, the task, if considered from the perspective that it is merely one component of the modernization of the DLSS along functional lines (as discussed in Part I of this report), and a necessary step in the conversion to variable-length record formats (as discussed above), can certainly be done over the period of several years during the DLSS modernization process. The MODELS design concept must facilitate change and provide flexibility. As such, it must integrate into the operational systems the new, standard transactions as they are defined and published in modernized DLSS procedures.

*MODELS Requirement:* DLSS transaction formats should be variable-length records and should conform to an electronic data exchange standard. Serious consideration should be given to using ANSI X12 EBDI Standards to establish compatibility with the commercial sector. Therefore, DLSS transaction formats should be formulated and established in cooperation with the Transportation Data Coordination Committee, the ANSI X12 Committee and its associated subcommittees, and industry representatives.

The variable-length/variable-field transaction record provides the opportunity to take full advantage of modern processing and telecommunications technologies and to transmit both common and S/A-unique data within a single transaction.

These changes, while they will take several years to implement, provide the flexibility to (1) accommodate all intra-S/A and inter-S/A data communication needs for the future, (2) enable rapid changes in data transmission requirements to meet management's dynamic information needs, (3) incorporate and take full advantage of new processing and communications technologies as they become generally available [gateways, Integrated Services Data Networks (ISDNs), distributed data base management systems (DDBMSs)], (4) satisfy most of the processing and telecommunications requirements stated above for an eventual DoD-wide logistics community information network, and (5) accommodate DoD-to-commercial interfaces.

B.3 Interactive Data Access and Update.

Three modes of automated information access exist in today's processing environment:

- Interactive, on-line inquiry
- Electronic mail
- Batch processing.

Each of these access methods is available and used in DoD and many commercial systems today. They will all remain acceptable methods of information access

for the foreseeable future. However, the circumstances under which each method is most advantageous are changing and will continue to do so.

B.3.a On-line, Interactive Access.

Integrating user input and machine output in a dynamic, real-time, give-and-take process is considered the optimum mode of computer access by the computer literate end-user. Users interviewed at retail-level supply centers and maintenance personnel who have used personal computers indicated a desire for interactive inquiry into available retail and wholesale stocks, interactive inquiry for requisition status, and, if possible, interactive requisitioning to ensure that available stocks would be issued to fulfill their request. While this capability would be desirable for all priorities of requisitions, interviewees all acknowledged that only Priority Group I requisitioning access would be practical.[3]

A major issue to be resolved relative to on-line, interactive supply availability inquiry is that interactive inquiry for stock availability only provides the user with information that the stock "may" be available when the subsequent requisition is processed; it does not guarantee availability. Therefore, decisions might be made on the basis that stock would arrive within a particular time frame when, in fact, by the time the actual requisition is processed, the stock might be depleted and the item would have to be backordered. Some on-line, interactive stock availability inquiry is currently being performed successfully, and users with that capability are satisfied with the processing. However, if that capability is provided to the entire logistics

[3]An interesting observation from these field-level users is that any interactive inquiry and update requisitioning capabilities should permit only a single inquiry per item, and the system response should be an acknowledgment that the requested quantity or a lesser quantity was available for issue. The reasons for these restrictions are to keep end users from identifying the total quantity available and therefore ordering more than needed if they perceive a short supply condition. For example, if a user needs three items, and could determine that only four were available, he/she might be tempted to order all four under the assumption that the next time he/she needed the item, none would be available.

community, even for Priority Group I inquiries only, that satisfaction could change dramatically.

Thus, while there is a real need for some level of immediate access to information on stock availability, particularly to meet Priority Group I requirements, the optimum solution to satisfying the requirement is not immediately obvious and additional analysis must be performed.

While interactive stock availability inquiries require the resolution of many issues, such is not the case with interactive requisition status inquiries. In this situation, the end-user requires only the most currently reported status of a requisition that has already been initially processed. Such a system must have the capability to provide the requested information within a few seconds of inquiry, and the requisitioner should not be required to identify the system from which information must be retrieved. That is, the requester's computer system network must have a network-switching capability that automatically connects the user to the system containing the requested information. This distributed data management capability is discussed in Part II, Chapter B, Section B.6.

As S/As implement modernization programs, incorporating DBMS technology and the ability to provide interactive, on-line information access, demands for such access internal to the S/A will increase. The demand will not be long denied once the capability is available because arguments for substantial increases in productivity and associated cost avoidances will dominate decisions. Once intra-S/A interactive access is established, the next demand will be for inter-S/A interactive access to satisfy a broad range of operational and management decision-making requirements. Therefore, the Defense Logistics Standard Systems Office (DLSSO) must identify the standards for how, who, what, when, and how much inter-S/A interactive systems inquiry and update capability can and will be provided in peacetime

and wartime. These standards must be established now to serve the DoD logistics community of tomorrow.

> *MODELS Requirement:* The modernized DLSS must establish procedures and standards for DoD-wide interactive logistics information inquiry.

B.3.b Electronic Mail Access.

On-line access through an electronic network to leave transactions/messages for electronic processing and/or human on-line retrieval is rapidly becoming a convenient method for person-to-person communication of descriptive text, graphics, and alphanumeric information not amenable to standard transaction formatting. The method is particularly appropriate when a single set of information (e.g., pipeline performance reports) must be distributed quickly to a geographically broad-based group of users. In the electronic network, a mailing list can be predefined and the set of information can be electronically transmitted almost instantaneously to all recipients.

Within the logistics community, electronic mail could also be a useful method for rapid information inquiry avoiding problems of system degradation from heavy loads of interactive inquiry processing and the need to implement extensive security measures to validate and restrict different levels of individual access to records or data elements. For example, an Inventory Manager (IM) could leave an electronic mail message in a designated system mailbox of a retail-level supply activity, requesting information concerning the availability of several critically needed parts not currently in stock at any depot. The retail-level supply personnel could be quickly notified of the electronic request, could check system inventory records and review the request with maintenance and repair managers, and then either send a message back to the originator's system or leave the response message in the original mailbox for the originator to check. This electronic mail processing reduces

transactional message traffic, improves information flow between the parties, avoids costly and time-consuming telephone call-back exchanges, and reduces requirements for providing security access to the computer for every possible organization that might request information.

Electronic mail inquiry is the current method used in the Army LIF system for information on the status of requisitions. The information inquiry is entered in a predefined format so that it can be automatically processed. Research is also being conducted by the Navy to employ computational linguistics and artificial intelligence data-processing techniques[4] to develop capabilities that will enable systems to automatically handle a variety of messages, from highly formatted messages with little English description to messages consisting entirely of English narrative.

Electronic mail would be a valuable communications method for logistics information during a mobilization or deployment period. Events during such a period will create substantial data-processing surges, restricting interactive inquiry and processing. Units on the move to new locations could use electronic mail capability to submit logistics transactions (e.g., requisitions), with subsequent transmission of responses to the originator's mailbox. Then, when time and conditions permit, the deployed unit could retrieve the status responses.

Electronic mail will increase as a means for making logistics information available on a more timely basis. Therefore, the DLSS need to standardize procedures for using electronic mail for inter-S/A logistics communications.

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[4]*Computational Linguistics* – the use of computer capability for narrative message interpretation that consists of (1) message decomposition, which determines the overall structure of a message, and (2) narrative analysis, which generates the structure that enables the computer to interpret the English narrative.

*Artificial Intelligence* – the development of a machine capability to perform functions normally concerned with human intelligence, such as learning, adapting, reasoning, self-correction, and automatic improvement.

*MODELS Requirement:* The MODELS concept must provide for an electronic mail capability.

B.3.c Batch Processing.

Using standardized transaction formats with a coded-source address transmitted through the AUTODIN system is the most dominant method of remote system access in use in the DoD logistics community. It is used for data input, information inquiry, and status reporting. In the future, batch processing will still be a valid method for accessing logistics information. Replenishment requisitions, Materiel Release Orders (MROs) and Materiel Release Confirmations (MRCs), routine performance measurement data, routine contracts data, invoice data, and similar routine logistics information do not require the added costs of near-real-time or interactive processing. The information can be accumulated into output files and transmitted in batches to be processed at the appropriate receipt facilities, on a scheduled, periodic basis.

The logistics management and operations systems encompassed by the DLSS will continue to require batch processing capability. Aggregations of data (batches) will continue to be transmitted from requester to ICPs, to depots, to transportation agencies, and to finance centers, etc., via AUTODIN, and eventually DDN (dedicated lines for bulk batch data transmission) for the foreseeable future. The DLSS must continue therefore, to prescribe the transaction types, formats, procedures, and communications protocols for batched, inter-S/A logistics information flows.

*MODELS Requirement:* The MODELS concept must provide for continued use of batch processing and the standardized exchange of data in batches.

B.4 Heterogeneous Data Network Interoperability.

The DoD logistics community currently has installed mainframes, minicomputers, and microcomputers from just about every manufacturer in the commercial marketplace, including:

- International Business Machines Corporation (IBM)
- Honeywell
- Data General
- Amdahl
- Sperry
- Perkin-Elmer
- Tandem
- Digital Equipment Corporation
- Zenith
- Burroughs
- Gould
- Compaq.

Because of procurement policies in the Federal Government, this mixture of heterogeneous (dissimilar) equipment can be expected to continue in the future. However, the above discussions indicate an expected increase in existing requirements to provide a level of inter-S/A network interoperability for the rapid sharing of critical and routine logistics information.

As the DoD continues to integrate its operations through the interorganizational use of communications networks and their respective logistics information networks, the problems associated today with heterogeneous equipment, data bases, and applications could become more severe. Resolution of those problems will require planning and management. The telecommunications and computer industries are addressing those challenges through the development and promulgation of interface standards. The primary organization responsible for standards, worldwide, is the International Standards Organization (ISO). One of its committees, which has representatives from several U.S. Federal organizations including DoD, is developing an architecture for defining processing functions

performed in a data communications system known as the Open Systems Interconnection (OSI) model. This model is discussed in Appendix A.

Those activities and similar activities of other organizations to develop standards for data administration and management, data communication, and data query languages will continue and will provide the information user with:

- Improved identification of, and access to, valuable information resources that can be used by others in the same organization or shared with other organizations
- Reductions in unnecessary development of computer programs when suitable programs already exist
- Simplified software and data conversion to new, upgraded hardware through the provision of consistent documentation and standards
- Increased portability of applications and acquired skills, resulting in reduced applications maintenance and personnel training costs.

A variety of experimental developments are underway in heterogeneous system network interoperability both in DoD and in the commercial marketplace. While a limited number of operational systems currently exists, solutions to most of the technical problems can be expected within the next 5 years, and during that time the necessary standards to provide substantial interoperability will probably be defined. Many of the hardware interface protocol problems have been solved, and distributed data base interfaces are being defined. Once these network interfaces are established and operationally proven, the evolutionary development of a total DoD shared-logistics information system network will face no technological constraints.

Logistics management systems and information are distributed worldwide. This information, contained in many heterogeneous systems, needs to be rapidly communicated between many systems and organizations. DoD is developing a

communications network, the DDN, to handle that traffic, but in time of mobilization and/or deployment, communications networks of other countries and commercial organizations may be needed to adequately handle the increased surge of logistics information flows.

> *MODELS Requirement:* DLSS modernization should carefully review existing and developing communications standards for the OSI seven-layer reference model to facilitate interoperability in the logistics community.
>
> DLSSO must take an active role in ensuring adherence to DoD-wide logistics applications data management standards. The MODELS concept should be developed based on an assumption that the appropriate level of expertise will be available.

B.5 Data Base Management.

New functional requirements continue to evolve and create a continuous increase in the volume of information that must be exchanged among logistics organizations. However, existing, obsolete, and incompatible file structures are not able to effectively accommodate data exchange nor handle the system reorientation required to support new functional requirements, such as logistics management by weapons system. For these reasons, the trend in the S/A is away from flat-file orientation and home-grown DBMSs or file management systems toward commercially available DBMSs.

In this context three areas need to be addressed by MODELS:

- Data element standardization to more effectively accommodate data sharing among the S/As
- Conformance to data model standards, being defined at the national and international level, when procuring a DBMS
- Development of software to facilitate access to heterogeneous DBMSs and file structures (distributed data management).

This section discusses the need for DBMSs and the requirement for data element standardization. Data model standards are discussed in Part III, Chapter C. Distributed data management and accessing heterogeneous DBMSs are discussed in this part in Section B.6.

Both the file management system and the DBMS approaches are supported by a large number of commercial software packages. For the file management approach, virtually all large-scale computers, minicomputers, and most microcomputers use Common Business Oriented Language (COBOL) and other high-level language compilers. The DBMS approach represents hundreds of individual application packages. Factors to be considered by an individual organization in determining which approach should be used include organizational structure, hardware constraints, software constraints, support staff, performance requirements, cost, query- and report-generation requirements, security, data sharing environment, data usage pattern, data volume, and others.

The file management approach involves development of specially designed application software programs. Those software programs provide all the needed application functions and are usually written in COBOL or another high-level programming language. Data records having simple and common formats are combined into distinct files. The programming staff develops each application separately, working out program logic and file designs that seem convenient and effective for the specific required processing. The programming staff must be aware of the appropriate file access methods and must support relationships between files by special programming procedures. In most cases, the file management approach relies heavily on batch mode processing.

The DBMS approach can use a commercially available DBMS. A DBMS is a software system allowing multiple, independent users concurrent access to a shared data base. A data base consists of an interrelated set of data stored together with

controlled redundancy to serve one or more applications. The DBMS provides a controlled approach for adding new data and modifying and retrieving existing data. That approach provides a degree of data independence in that data can be accessed logically without knowing any special physical access method or procedure supporting the data access.

A particularly important consideration in data-base design is to store the data so it can be used for a wide variety of applications and can be changed easily and quickly. In file-oriented systems it is very difficult to change the way data are used. Modifications can set off a chain reaction of changes to existing programs and can be exceedingly expensive. When a single set of data items serves a variety of applications, different application programs perceive different relationships between the data items. A data base used for many applications can have multiple interconnections among the data. Use of data-base techniques can permit users to employ the data in ways that cannot and need not be precisely anticipated by the system designers.

Today, DBMS vendors provide a complete set of integrated tools along with the basic DBMS package. These tools include data dictionary, teleprocessing monitor, query facility, report writer, application development facility, and special-purpose application packages built upon the DBMS. Integration tools can make the DBMS environment much easier to use.

End-user-oriented data bases are very good at extracting a small amount of data from a large data base and quickly presenting the results to the user. Data-processing-oriented DBMSs are best in data structuring capabilities and provide performance-tuning capabilities for choosing access methods and physical storage strategies most appropriate for the application.

Much redundancy exists in data that is used throughout DoD, and the same item of data is often defined slightly differently by the various S/As. Correcting the

imprecision in the way data is defined and used must go hand-in-hand with the design and stage-by-stage integration of data bases. A DLSS data dictionary defining all data items that are in use in DoD logistics must continue to be expanded, based initially on the current LOGDRMS.

A data dictionary is a central repository of information about the entities, the data elements representing the entities, the relationships between the entities, and their origins, meanings, uses, and representation formats. The benefits of using a data dictionary are related to the effective collection, specification, and management of the total data resources of an organization. A data dictionary should help a data base user in:

- Communicating with other users
- Controlling data elements in a simple and effective manner, that is, introducing new elements into the systems or changing descriptions of existing elements
- Reducing data redundancy and inconsistency
- Determining the impact of changes to data elements on the total data base
- Centralizing the control of the data elements as an aid to data-base design and to expanding the design.

The data dictionary can be used to standardize the use of data or simply to disseminate information about the use of data. If the sharing of data is wide and prevalent, it will be necessary to utilize the data dictionary to provide for standardization, where appropriate. On the other hand, if only minimal data sharing is necessary, the requirement for standardization is minimized and more emphasis will be placed on dissemination of information about data.

Within the DLSS, the LOGDRMS program encompasses development of a standard data dictionary to support information interchange in the logistics community. DLSC establishment of a master logistics data directory has been proposed. In that case, data elements would be classified and described using the same discipline

and procedures used to establish an item of supply in the system. This master logistics data directory concept would identify:

- The kinds of logistics data that exist
- The data location
- The organization responsible for the data integrity and update
- The users authorized access to the data
- The directory interrogation procedures
- The data source input format.

> *MODELS Requirement*: The MODELS concept recognizes the use of modern DBMS technology by the S/As and must provide for procedures to standardize data element definitions in the S/As. In the interim, data dictionaries should be established to facilitate inter-S/A data element translations. (Correlates to MODELS Requirement – Part I, Chapter A, Section A.1, page I-11 and Part II, Chapter B, Section B.1, Page II-12.)

B.6 Distributed Data Base Management.

A DDBMS is the software system that manages data within the data base that is distributed in different locations throughout a computer network. Distributed data base management technology is the logical merging of two trends in computing: DBMS and data communications networks. A distributed data base environment is an integrated data base that is built within a computer network rather than within a single computer. Requirements of a true distributed data base include the ability to:

- Distribute data files between at least two computer nodes while the location of the data is transparent to the user
- Retain data file relationships (even when the files are located at separate network nodes)
- Ensure transaction integrity in the distributed environment.

There are two types of DDBMSs, heterogeneous and homogeneous. The heterogeneous DDBMS prototypes under development permit only retrieval of data

distributed throughout the network, whereas a homogeneous DDBMS will support both retrieval and update operations.

Through its data dictionary, a DDBMS knows which data are where, what the logical and physical structures of those data are, and how to access them. A heterogeneous DDBMS consists of a global, or neutral, data definition language that describes common data and a global, or neutral, data manipulation language that manipulates those descriptions to provide access to the data whether they are stored in a DBMS or under a specialized file control system.

The features that distinguish a heterogeneous DDBMS are defined as:

- Interconnection of dissimilar DBMSs
- Use of dissimilar operating systems to support the collection of DBMSs
- Use of dissimilar host computers within the network to serve a variety of functions (e.g., addressing, formatting, etc.).

An issue associated with this last feature is that of gateways between networks. A gateway provides the capability of passing data between connected networks and resolves crossover problems. Gateway functions can be performed within the host computer of the DBMS, by front-end processors, or by centralized processors, such as DAAS.

Heterogeneous DDBMS technology is still in its infancy. A recent survey reveals that only experimental prototype systems exist. No operational systems exist that are truly distributed in the heterogeneous DDBMS sense. Current DDBMS efforts are discussed in Part III, Chapter C. As of today, there are still many unresolved problems in the heterogeneous DDBMS area:

- *Structured-Data Transfer Protocols.* File transfer protocols have been developed to transform data from a specific existing format to another specific target format. Structures and pointers are manipulated to create the new data format for the transfer. More research is needed to provide software capable of fully supporting the migration of data among the multiple computers of a DDBMS while preserving the correct data semantics.

- *Common Global Data Model.* Research and standardization are needed in the development of a common global data model to accommodate merging extracted data coming from different DBMSs with different data models.

- *User-Friendly Interfaces.* Interfaces should include not only an easy-to-use data access and manipulation language but also easy-to-use resultant data integrated in a format that is readable and can be manipulated by other software for analysis, modeling, or graphics display.

- *Semantic Integrity of Data.* Data existing at different sites might have different semantics; for example, a field called Unit of Issue might have different unit semantics, with a wholesale site using 'gross' as a unit and a retail site using 'each' as a unit. Data within the network must be consistent and correct.

- *Multi-Site Updates.* For data bases that are replicated, an update to one data base involves updates to all the repeated parts without a long delay time. Although many algorithms exist to solve this problem, more research is needed to ensure consistency of data as well as efficient operation within the network.

- *Distributed Dictionary and Directory Management.* Distributing and managing the dictionary/directory information within a DDBMS can be done in many ways, with each separate way having advantages and disadvantages. Evaluation of these various methods and efficient ways of handling dictionary/directory information in case of site failure remains a challenging topic.

While full-scale heterogeneous distributed data base processing will probably not be available until 1990 – 1995, the logistics community does not have to wait for the availability of this technology before using the concept. The DLSS have already led to the development of a common set of information interchange standards that provide the basis for interconnecting logistics data bases. It is likely that these standards will simplify the implementation of distributed data base access. In addition, the types of on-line data base access initially anticipated for logistics applications will be restricted, for example, to inquiries of requisition status, item availability, and catalog information. Here again, these restrictions simplify the required capabilities of the heterogeneous DDBMS. For these reasons, it is likely that the technology to meet many of the needs of the DoD logistics community already exists.

*MODELS Requirement:* The MODELS concept must be structured to take advantage of the emerging DDBMS technology. Existing DDBMS technology should be reviewed to determine its ability to address the needs of the logistics community.

B.7 Data/Voice/Video Communications.

Many information industry experts believe that the integration of data, voice, and video technology is essential to bringing information management to the next generation of users – those who have little patience for cursor keys, rigid command structures, and keyboard data entry. Major computer and communication organizations, such as American Telephone and Telegraph (AT&T) and IBM, want to make computer system interfaces that are as easy to learn and use as the telephone and television.

Integrated data/voice technology encompasses several applications including: (1) speech recognition and synthesis, in which a telephone caller can receive a prestored voice message dictated specifically for him/her and released only on voice recognition of their name or a preestablished voice password, and the subsequent voice storage and playback of any message the caller leaves in response to the initial conversation (a product with the potential to stop much of the telephone "tag" that occurs today); (2) speech recognition control of computer applications (e.g., placing a formula to calculate the sum of the monthly entries in the spreadsheet cell after the December entry and calculate the totals); (3) text-to-speech conversion in which online help facilities are voice actuated to speak the help lessons or messages typed at one location (electronic mail) are voiced to the receiver at a remote location, for example, for an electronic mail requisition status inquiry; and (4) speech-to-text conversion in which the computer user dictates the information for a memo or message directly to the computer rather than having to enter it through a keyboard.

Integrated data/video technology encompasses an even larger spectrum of potential applications. Those applications include self-training and simulation materiels of all types, pictures of items to be purchased, detailed visual maps/pictures of places being traveled to for complete orientation to streets and buildings, and electronic transmission of publications/catalogs, including charts, graphs, and pictures.

The final integration of data/voice/video brings all of these various applications into their full potential. Applications may include picture telephones for remote face-to-face purchase negotiations, voice requests to the national catalog system for identification of unknown items received in a shipment, and voice requests to an ICP to visually review potential substitutes for a part currently out-of-stock. The opportunities offered by these emerging technologies are limited only by the imaginations of the potential users.

The integration of these technologies is still in its infancy; however, with multiple small, innovative firms pushing the limits of existing technology and large organizations such as AT&T and IBM fully recognizing the potential in the commercial marketplace, one can expect that the 1990 – 1995 time frame will see some, if not all of those capabilities commercially available. Appropriate use of these technologies, like the telecomputing technologies in use today, will require the development and publication of communication standards and procedures. The capabilities offered by these technologies will do much to further increase inter-S/A interfaces as they bring a whole new generation of users into daily use of telecomputing capability. As the official DoD instrument responsible for establishing logistics standard systems, the DLSS will need to address how these emerging technologies can best be incorporated into improving logistics operations and management. It is critical to the MODELS concept – and mandatory if DoD is to ensure long-term stability of standard logistics communications – that the DLSS

have the flexibility to allow the S/As to progress at different rates in the implementation of new technologies.

> *MODELS Requirement*: The MODELS concept must be structured to accommodate rapidly evolving advanced computer and communication technologies.

# CHAPTER C: LOGISTICS MANAGEMENT INFORMATION REQUIREMENTS

The MODELS project is one of many ongoing OSD and Services/DLA initiatives to improve logistics management. Congressional oversight on multi-billion dollar weapons system developments and operation budgets, billions of dollars in spare parts inventories, and perceived waste in DoD disposal of near-new parts have resulted in the placement of great emphasis on better management of DoD logistics programs. More usable and timely information must be available to various levels of logistics managers to improve planning and decision-making.

This chapter discusses the following logistics management initiatives that are responsible for establishing the types of information that must be exchanged as well as resetting the tone of logistics management philosophy and processes:

- *Secondary item weapons system management*
- Issue and transportation priority coding
- In-transit visibility
- Contract-related information exchange.

C.1 Weapons System Management Issues.

The DoD Supply Management Policy Group (SMPG) has defined Secondary Item Weapons System Management (SIWSM) in terms of 13 functional requirements. The objective of the SIWSM initiative is to enable DoD to manage inventories of spare and repair parts to achieve improved materiel readiness and performance goals for each weapons system. SIWSM will require a realignment of both logistics processes and operational objectives. As a result, it will have a tremendous impact on the modernization of the DLSS. The 13 SIWSM functional

requirements, as approved by Secretary Weinberger, and discussion of their impact on DLSS follows.

- *Application Files.* The S/As should maintain data files reflecting full indenture breakdown for all supported weapons systems. The files will be designed for use in requirements determination and will reflect relative priority between items with respect to the next higher assembly and ultimately to the weapons system.

- *Stock Levels by Weapons System.* The S/As should develop capability to stratify the segments (e.g., stock safety level and economic order quantity) of inventory requirements by weapons system for both peculiar and common items. Common items should be stratified according to usage, by application.

- *Multiechelon Optimization Models.* The S/As should develop inventory requirements models that will generate requirements for wholesale, intermediate, and consumer levels to support weapons systems availability goals at minimum cost. This requirement directs a shift from the traditional objective of meeting fill-rate goals to the objective of meeting weapons systems operational availability goals.

- *Integrated Initial/Replenishment Spares and Repair Parts Computations.* The S/As should ensure that allowance computations for initial provisioning are consistent with the computations of replenishment requirements.

- *Asset Visibility.* The Integrated Materiel Manager (IMM) should have DoD-wide asset visibility down to the lowest supply echelon. Within the S/As, the full asset visibility required does not currently exist. This is particularly true of Service-owned assets managed by another Component at the wholesale level. Also, visibility of assets held in the industrial funds is inadequate.

- *Demand/Usage Reporting.* The S/As should implement the capability to code and record demands and maintenance usage data by weapons system. The procedures for generating requisitions will have to be modified to efficiently and accurately capture weapons system applications at the source. The information systems at each supply echelon will have to be modified to perpetuate these data.

- *Inter-S/A Data Exchange.* The S/As should implement the capability for exchanging end-item program and application data, secondary item demand and usage data, and information on resupply times.

- *Performance Tracking.* The S/As should implement performance tracking systems to measure supply and operational availability performance by weapons system. Standardized DoD-wide performance measurement criteria for supply and operational availability performance by weapons system should be incorporated into DLSS-expanded procedures.

- *Asset Positioning.* The S/As should implement the capability to position items essential to weapons systems so that requisition response time is minimized. The Services are required to accomplish this within their own storage and distribution systems, while DLA will accomplish it within the DoD-wide storage and distribution system to include Service-operated sites. Optimal positioning for reparable items should consider the location of both storage and repair facilities.

- *Redistribution.* The S/As should implement the capability to redistribute essential weapons system items on a system-wide basis to achieve weapons system readiness objectives. This capability should be developed in conjunction with the requirements for asset visibility discussed above.

- *Development of Planning, Programming, and Budgeting System (PPBS) Inputs.* The S/As should implement the capability to prepare their Program Objective Memoranda (POMs) and secondary item budget submissions on a weapons system basis.

- *Budget Execution.* The S/As should implement the capability to monitor budget execution on a weapons system basis. This capability should be consistent with the systems created to formulate budget submissions on a weapons system basis.

- *Balancing Resources.* The S/As should implement the capability to determine the optimal allocation of resources among procurement, repair, and distribution to achieve maximum weapons system effectiveness.

  MODELS Requirement: The MODELS concept requires a highly efficient and reliable system of telecommunications and gateway processors to support inter-S/A queries and transfer of various types of weapons system-related data. Any data exchange programs to support weapons systems must be designed to accommodate classified data.

C.2 Priority Issues.

A second change in DoD-wide logistics management information requirements relates to the Uniform Materiel Movement and Issue Priority System (UMMIPS). A recently completed study of the UMMIPS by the Logistics Systems Analysis Office (LSAO) found that a total cost avoidance of $117 million was achieved through the S/A's air challenge programs downgrading of nearly 200,000 air eligible shipments to surface modes. The LSAO concluded that the customer is really concerned about whether he/she will get the item allocated rather than how many days it takes to arrive after it is issued. The LSAO recommends that the Office of the Deputy

Assistant Secretary of Defense (Logistics and Materiel Management) [ODASD(L&MM)] should promulgate new and revised policies to incorporate the flexibility to accommodate a dual supply-issue and transportation priority system.

The MODELS team interviews and operational reviews found similar conditions both at the shipping centers (depots) and from comments expressed by customers. A two-priority system is needed to separately reflect issue priority and transportation priority within the requisition transaction.

> *<u>MODELS Requirement</u>:* The MODELS concept should provide for modernized DLSS procedures and transaction data elements to accommodate implementation, through UMMIPS, of separate issue and transportation priority coding systems.

C.3 <u>In-Transit Visibility</u>.

As the cost of maintaining the armed forces has grown over the years, the investment in stock levels has become an increasingly critical issue. Depot stocks are, with some exceptions, maintained in CONUS. Retail stocks should be maintained at the minimum level consistent with a responsive supply and transportation system. One critical problem to effective stock-level management is the lack of common data in two of the DLSS – MILSTAMP and MILSTRIP.

Within the MILSTAMP procedures and related transportation systems, identification of cargo being moved is by a TCN. With some exceptions, such as for safety, financial, or security considerations, transportation management is not concerned with "what is in the box." However, others need to know what is moving, when it will be delivered, and similar information about the cargo. Logistics information requirements in cargo movement are not clearly identified and vary depending on the position of the activity requesting the information within the logistics organization.

MILSTRIP's basic data are the NSN and requisition number. [illegible] exceptions, the Army LIF provides the [illegible]

transportation), these data are available by cross-reference of requisition number to TCN at the origin of the shipment where the materiel enters the transportation [Military Standard Transportation and Movement Procedures (MILSTAMP)] system. The problem is compounded by the consolidation process necessary to utilize transportation assets effectively and reduce transportation costs. The large volumes of data also have a direct impact on data availability. The shipper, such as a depot, normally consolidates a number of requisitions under one TCN. That TCN may in turn be consolidated with other TCNs at a container consolidation point, an aerial port, or another node in the transportation network. Each level of consolidation further compounds the problem of specific-item visibility.

In CONUS surface and air shipments, only the shipping activity knows what has been shipped and only the commercial carrier knows where the shipment is during transit. While advance copies of GBLs and other forms of notification are forwarded to receiving activities, in many cases the shipment moves faster than the notification.

In-transit visibility has been the subject of continuing dialog within DoD for many years. Various elements of DoD have indicated a need for shipment and item tracking information. Three major issues are involved:

- Responsibility – Who needs certain information/data?
- Level of detail – What information is needed?
- Availability – How is the information to be provided? (This issue presents both processing system and communications problems.)

Although one cannot expect the MODELS project to solve all the issues in this area, it can and should provide a framework for their resolution. It is very important that the MODELS system concept recognize these issues and be structured to contribute to their resolution.

*MODELS Requirement:* Modernized DLSS procedures should improve on existing supply-transportation interfaces by providing specific-item visibility during the shipment process. (Correlates to MODELS Requirement – Part I, Chapter E, Section E.2, page I-88.)

C.4 Contract-Related Information Exchange.

On 10 January 1986, the Deputy Assistant Secretary of Defense (L&MM) issued a memorandum to the Services to initiate a joint MILSCAP Improvement Program to automate the interchange of contract-related data throughout the DoD at the earliest opportunity – even before MODELS is complete. This objective includes full electronic interchange of required contractual data between Defense Contract Administration Service Regions (DCASRs) and ICPs, and subsequent dissemination to depots for destination acceptance reporting. Implementation of this capability will have a significant impact both upon Military Standard Contract Administration Procedures (MILSCAP) and MILSCAP information transmission formats.

A major drawback to the current MILSCAP information data structure is the restricted 80-column card format that often requires the preparation of multiple trailer cards. The opportunity now exists to take advantage of advanced processing and telecommunications capabilities to expand the record size beyond 80 columns to accommodate a large text field of contract-related descriptive information.

*MODELS Requirement:* The MODELS concept must provide for electronic exchange of large text-fields of contract-related information. (Correlates to MODELS Requirement – Part I, Chapter C, Section C.2.a, page I-37.)

# CHAPTER D: INFORMATION RESOURCES MANAGEMENT INPUT CONSIDERATIONS

## D.1 Objectives.

Congress has mandated that each Federal Agency establish Information Resources (IRM) planning. In the DoD, responsibility for preparation of the IRM Plan is assigned to the Comptroller. The Comptroller in turn collects IRM plan inputs from each organization involved in the formal development of information, both automated and nonautomated. This section addresses: (1) why DLSSO should provide a logistics-oriented input to the IRM planning process, and (2) what information should be included in a DLSSO IRM input document.

## D.2 The Need for Planning.

It would be unthinkable to build a complex weapons system without an overall plan. The design and development of a weapons system, such as a fighter aircraft, begins with an overall plan that defines the desired performance of the completed aircraft. To achieve these broad performance goals the design is divided into functional areas: power plants for propulsion, airframes for the aircraft structure, and control systems for navigation, weapons delivery, flight controls, etc. Each of those functional areas is assigned specific performance objectives that contribute to the performance goals of the completed aircraft.

This design approach permits a highly complex problem to be divided into manageable parts. Each part can then be designed independently to meet its specific performance objectives. Even though the design effort for each part proceeds independently, the overall plan ensures that the parts will fit into the overall system.

The design and development of a modern information system is no less complicated than those of the fighter aircraft. IRM for an organization or a functional area (e.g., logistics) can be used to develop a plan that defines and controls the design and development of information resources and systems[5] by:

- Defining the goals of the information system and associating those goals with the goals and mission of the function/organization that the system supports.
- Defining specific objectives of subsystems and associating those objectives with the goals of the total system.
- Prioritizing subsystems in terms of resource requirements and associated goals.
- Evaluating subsystem performance in meeting specific objectives.

Modern information systems that employ distributed processing, electronic interchange of data, and shared data bases must employ this kind of top-down planning to be successful.

D.3 <u>Background of Agency IRM</u>.

The Federal IRM Review Program is a Government-wide program established to support improvements in Federal information resources management and to meet certain requirements of the Paperwork Reduction Act of 1980, Public Law 96-511. Specifically, the program was designed in response to requirements that agencies review their information management policies and procedures to ensure they were adequate. The Office of Management and Budget (OMB), with assistance from GSA, is directed to report to Congress on how well agencies are doing.

The Paperwork Reduction Act requires that each agency appoint an official to periodically review major informations systems and ensure that data collection and

[5]System, as used in this chapter, refers to the personnel resources, hardware, and software that comprise the total process involved in generating information to operate and manage the designated function (e.g., logistics) or organization.

reporting burdens are minimized, that systems do not overlap or duplicate functions, and that information system acquisitions are cost-effective.

D.4 IRM Directives, Scope, and Definition.

OMB Circular No. A-130, *Management of Federal Information Resources*, implements OMB's authority under the Paperwork Reduction Act. The Federal Information Resources Management Regulation (FIRMR) issued by GSA is the primary regulation governing information resource management and information systems acquisition. To supplement the FIRMR, GSA also published the *Federal Information Resources Management Review Program, An Executive Guide* and the *Strategic Information Resources Management Planning Handbook*.

DoDD 7740.1, 20 June 1983, establishes the IRM Program within DoD. That directive applies to the OSD, the Military Departments, the Organization of the Joint Chiefs of Staff (OJCS), the Unified and Specific Commands, and the Defense Agencies.

DoDD 7740.1 provides a rather broad definition of IRM:

> The policy, action, or procedure concerning information (both automated and nonautomated) that management establishes to serve the overall current and future needs of the organization. IRM policy and procedures would address such areas as availability, timeliness, accuracy, integrity, privacy, security, auditability, ownership, use, and cost-effectiveness of information.

D.5 DoD IRM Program Goals.

The IRM Systems Directorate, Office of the Assistant Secretary of Defense (Comptroller), promulgated five IRM goals for DoD in late 1984

- Improve DoD mission operations and decision making through the effective and economic development and use of information
- Integrate DoD information management activities through [illegible] consistent plans, programs, policies, and procedures
- Acquire and use information technology to improve [illegible] productivity, and program management

- Strengthen life cycle management of information systems
- Foster general awareness of the value of information and its associated costs.

These goals have clear implications for the MODELS project and the DoD logistics community.

An overall plan is required to describe the interfaces in terms of common data element definitions, telecommunication protocols, DBMS interface standards, security access procedures between systems, and electronic data transmission formats and to provide a coordinating process for the development of these interface systems. The objective is not to infringe on the creativity of the individual Service to produce a system to meet its specific needs but rather to define a framework to ensure that the systems developed by DoD Components operate efficiently within the total DoD logistics system. This approach optimizes the effectiveness of the total logistics system.

> *MODELS Requirement*: Individual S/A logistics systems need to be designed with the total DoD logistics community in mind. An overall DoD logistics systems modernization plan should be formally prepared and regularly updated as part of the MODELS continuing modernization process.

D.6 DoD Logistics Community IRM.

The purpose of the IRM plan is to examine current areas of application, identify opportunities for improvement, associate applications with specific DoD goals, track progress in meeting specific application objectives, and monitor costs associated with application development. As a management tool, the plan provides a means for projecting requirements to avoid crisis management, defining areas of responsibility, assigning responsibility, and tracking performance against specific goals. An IRM plan outline is presented in Appendix B.

To accomplish these objectives DLSS inputs to the DoD IRM Plan can cover several levels of the DoD organization. One decision that must be made by the ODASD(L&MM) is the extent of functional and organizational coverage of the DLSS inputs. To illustrate this question, the following discussion presents two possible approaches to developing IRM inputs for the DoD logistics community: documentation covering only DLSS projects and documentation covering both DLSS and DoD Component logistics projects.

IRM plan inputs for DLSS projects only is the simplest approach. The inputs would describe the functional areas for application development, DoD logistics system goals, and objectives for individual applications or standards. The plan would also show the relationships between specific applications and system goals, functional areas, and development costs. It would provide a framework for prioritizing projects and allocating resources within the DLSS program.

The second option would include descriptions of major logistics projects being developed by DoD Components in addition to the DLSS modernization projects being managed by DLSSO. The documentation would show the relationships between the projects being managed by other DoD Components and DoD total logistics system goals, functional areas, development costs, and interface requirements with DLSS projects. These inputs would provide a framework for prioritizing DLSS projects in relationship to the total DoD logistics community. While this second approach is clearly better from a planning standpoint, maintaining information on the many systems being developed by individual DoD Components is a difficult problem, especially when many of the systems are in the early development stage.

IRM documentation that includes modernization plans for all DoD Components could also be useful in defending budget requests for the development of new systems. The IRM documentation would illustrate the interrelationships between DLSSO projects and logistics projects being developed by DoD Components, and

would show the relationships between logistics modernization projects and DoD goals. The IRM documentation would provide a complete statement and picture of the total logistics community information technology and modernization projects and requirements.

A senior advisory group, composed of representatives of OSD, DLSSO, and selected DoD Components, should be established to review DLSS modernization plans and logistics system IRM plans prepared by other DoD Components to ensure that all plans include the requirements necessary to ensure effective interfaces between all DoD logistics systems.

## CHAPTER E. SUMMARY OF PART II MODELS REQUIREMENTS

Part II has presented operational requirements and considerations for implementing the DLSS functional requirements presented in Part I. The 19 MODELS requirements presented in Part II are summarized in this chapter. The section title for the requirement is listed along with the page number in the text to facilitate referral to the rationale for the requirement.

### A. LOGISTICS SYSTEMS USER REQUIREMENTS.

A.2 Inter-S/A Interface Requirements.

*MODELS Requirement:* The MODELS concept should provide the capability to implement on-line user interfaces with ICPs for stock availability and requisition status inquiry for, as a minimum, Priority Group I materiel requirements. (Part II, Chapter A, Section A.2, page II-4)

*MODELS Requirement:* The MODELS concept must provide a broad base of DoD users with access (not necessarily in real time) to data from contracting and contract administration activities that maintain information related to contract content and status. (Correlates to MODELS Requirement – Part I, Chapter C, Section C.2.a, page I-37.) (Part II, Chapter A, Section A.2, page II-4)

A.3 Interface Requirements of the Defense Transportation Function.

*MODELS Requirement:* DLSS procedures must provide for meeting the growing need for inter-S/A standardization of information to be collected and electronically communicated between DoD transportation agencies and customers and, between DoD and commercial transportation activities. (Correlates to MODELS Requirement – Part I, Chapter E, page I-81.) (Part II, Chapter A, Section A.3, page II-6)

A.4 Service-to-Service Interface Requirements.

*MODELS Requirement:* Modernized DLSS procedures and the MODELS information exchange technology concepts must provide standardized interfaces to unique commodity systems (e.g., ammunition, petroleum). Eventually such unique Service-to-Service and Service-to-DLA procedures and automated systems must be fully integrated into the MODELS concept. (Part II, Chapter A, Section A.4, page II-7)

A.5 Joint Chiefs of Staff (JCS) Mobilization Interface Requirements to the Logistics System.

*MODELS Requirement:* The MODELS concept should provide for a working interface between joint operations systems and the DLSS. (Correlates to MODELS Requirement – Part I, Chapter E, page I-81.) (Part II, Chapter A, Section A.5, page II-9)

## B. METHODS OF LOGISTICS INFORMATION EXCHANGE.

B.1 Data Standardization.

*MODELS Requirement:* The expanded-DLSS procedures must provide for the identification, definition, control, and dissemination of data standards. This role should include the development of data dictionaries. (Correlates to MODELS Requirement – Part I, Chapter A, Section A.1, page I-11.) (Part II, Chapter B, Section B.1, page II-12)

B.2 Variable-Length/Variable-Field Transaction Records.

B.2.a The Variable-Length/Variable-Field Transaction and ANSI X12 EBDI Standards.

*MODELS Requirement:* DLSS transaction formats should be variable-length records and should conform to an electronic data exchange standard. Serious consideration should be given to using ANSI X12 EBDI Standards to establish compatibility with the commercial sector. Therefore, DLSS transaction formats should be formulated and established in cooperation with the Transportation Data Coordination Committee, the ANSI X12 Committee and its associated subcommittees, and industry representatives. (Part II, Chapter B, Section B.2.a, page II-19)

B.3 Interactive Data Access and Update.

B.3.a On-line, Interactive Access.

*MODELS Requirement:* The modernized DLSS must establish procedures and standards for DoD-wide interactive logistics information inquiry. (Part II, Chapter B, Section B.3.a, page II-22)

B.3.b Electronic Mail Access.

*MODELS Requirement:* The MODELS concept must provide for an electronic mail capability. (Part II, Chapter B, Section B.3.b, page II-24)

B.3.c Batch Processing.

*MODELS Requirement:* The MODELS concept must provide for continued use of batch processing and the standardized exchange of data in batches. (Part II, Chapter B, Section B.3.c, page II-24)

B.4 Heterogeneous Data Network Interoperability.

*MODELS Requirement:* DLSS modernization should carefully review existing and developing communications standards for the OSI seven-layer reference model to facilitate interoperability in the logistics community.

DLSSO must take an active role in ensuring adherence to DoD-wide logistics applications data management standards. The MODELS concept should be developed based on an assumption that the appropriate level of expertise will be available. (Part II, Chapter B, Section B.4, page II-27)

B.5 Data Base Management.

*MODELS Requirement:* The MODELS concept recognizes the use of modern DBMS technology by the S/As and must provide for procedures to standardize data element definitions in the S/As. In the interim, data dictionaries should be established to facilitate inter-S/A data element translations. (Correlates to MODELS Requirement – Part I, Chapter A, Section A.1, page I-11 and Part II, Chapter B, Section B.1, page II-12) (Part II, Chapter B, Section B.5, page II-31)

B.6 Distributed Data Base Management.

*MODELS Requirement:* The MODELS concept must be structured to take advantage of the emerging DDBMS technology. Existing DDBMS technology should be reviewed to determine its ability to address the needs of the logistics community. (Part II, Chapter B, Section B.6, page II-34)

B.7 Data/Voice/Video Communications.

*MODELS Requirement*: The MODELS concept must be structured to accommodate rapidly evolving advanced computer and communication technologies. (Part II, Chapter B, Section B.7, page II-36)

## C. LOGISTICS MANAGEMENT INFORMATION REQUIREMENTS.

C.1 Weapons System Management Issues.

*MODELS Requirement:* The MODELS concept requires a highly efficient and reliable system of telecommunications and gateway processors to support inter-S/A queries and transfer of various types of weapons system-related data. Any data exchange programs to support weapons systems must be designed to accommodate classified data. (Part II, Chapter C, Section C.1, page II-39)

C.2 Priority Issues.

*MODELS Requirement:* The MODELS concept should provide for modernized DLSS procedures and transaction data elements to accommodate implementation, through UMMIPS, of separate issue and transportation priority coding systems. (Part II, Chapter C, Section C.2, page II-40)

C.3 In-transit Visibility.

*MODELS Requirement:* Modernized DLSS procedures should improve on existing supply-transportation interfaces by providing specific-item visibility during the shipment process. (Correlates to Models Requirement – Part I, Chapter E, Section E.2, page I-88.) (Part II, Chapter C, Section C.3, page II-42)

C.4 Contract-Related Information Exchange.

*MODELS Requirement:* The MODELS concept must provide for electronic exchange of large text-fields of contract-related information. (Correlates to MODELS Requirement – Part I, Chapter C, Section C.2.a, page I-37.) (Part II, Chapter C, Section C.4, page II-42)

## D. INFORMATION RESOURCES MANAGEMENT INPUT CONSIDERATIONS.

D.5 <u>DoD IRM Program Goals</u>.

*<u>MODELS Requirement</u>:* Individual S/A logistics systems need to be designed with the total DoD logistics community in mind. An overall DoD logistics systems modernization plan should be formally prepared and regularly updated as part of the MODELS continuing modernization process. (Part II Chapter D, Section D.5, page II-44)

# PART III: MODELS - CONCEPTUAL DESIGN CONSIDERATIONS

# CHAPTER A: ANALYSIS OF SYSTEM ARCHITECTURES

A.1 Introduction and Background.

This chapter presents a review of the organization (architecture) of Department of Defense (DoD)-wide logistics systems. It includes a discussion of the capabilities and characteristics of the existing system and those of two other alternatives – one with expanded switching nodes and one using gateway processors (GPs). These architectures are summarized in the following paragraphs.

The existing logistics network communications system architecture consists of two Defense Automatic Addressing System (DAAS) facilities that perform the routing and interfacing functions required to achieve interoperability among the various logistics systems. Although the existing architecture can satisfy many of the required functions of the logistics community, it is vulnerable to equipment failures. It also requires an expansion of the centralized data bases maintained at the DAAS nodes to provide the desired levels of on-line inquiry, as discussed in Part I of this report. This expanded use of centralized data bases, and the concept of retransmitting all logistics communications through central sites has a great potential for increasing communications costs. It is also difficult to maintain large centralized data bases that must be updated frequently to maintain the required level of information accuracy and timeliness.

The first alternative reviewed is an expansion of the existing configuration to a total of five switching nodes. That alternative is identified because of the reduced vulnerability associated with multiple switching nodes. However, its operational benefits appear to be limited and its cost would be substantially higher.

The second alternative architecture would replace the switching nodes with interfacing GPs installed at most major logistics sites. These GPs would perform

many of the functions now provided by DAAS. Implementation of this alternative would offer the ability to access local data bases directly using a decentralized design concept. Decentralization of data bases would reduce the number of redundant data bases required to support the system operation. This alternative, designated as Alternative 2, offers the potential of reducing the system-wide communications cost.

Chapter B discusses telecommunications issues, including anticipated growth in data communications traffic, alternative tariff structures for the Defense Data Network (DDN), and the transition of the specialized logistics networks to the DDN.

Chapter C discusses current trends toward the use of general purpose data base management systems (DBMSs). Those trends provide improved flexibility and expanded capabilities for logistics systems. However, a wide variety of different DBMSs have been selected by the Services and the Defense Logistics Agency (DLA). Variations in DBMS characteristics will increase the need for data element standardization if on-line access to logistics systems data bases is to be implemented.

The current interconnection of computer and communication systems in defense logistics exhibits characteristics of both centralized and distributed designs. It is distributed in that dispersed logistics organizations operate computer facilities for information processing. However, it exhibits centralized characteristics through single processing installations (e.g., DAAS) designated to provide control over the routing of logistics documents along with other centralized information management functions.

While this system has operated effectively for more than 20 years, the existing data processing communications and logistics environments are rapidly changing. For example, the introduction of the DDN provides the capability for transmitting messages using a variable-length message format. That format permits using flexible interface standards responsive to the individual requirements of members of

the logistics community (*Note* Direct remote access and computer to computer file transfers are also possible through DDN.)

Further environmental changes will occur with the introduction of modernized systems being developed by the Services and DLA, all of which incorporate the capability for on line terminal transactions. The potential of on line transaction processing and the anticipated capability to exchange graphics information between logistics activities will result in a significant increase in data communication traffic.

The changing environment requires that the MOdernization of DEfense Logistics Standard Systems (MODELS) project review the existing DAAS system structure. Another reason for this review is that the Defense Communications Agency (DCA) plans to impose user charges for transmitting data over the DDN. That charge emphasizes the need to control logistics information communications costs and dictates efficient use of network facilities.

A.2 Existing Communication Network System Architecture

System architecture is defined as, "The set of design principles, including the organization of functions and the description of data formats and procedures used for the implementation of a user application network."

When considered in terms of the current defense logistics system, the system architecture includes the data processing installations of the Services, DLA, and General Services Administration (GSA). It also includes the Automatic Digital Network (AUTODIN) and DDN communications networks that provide the primary media for logistics data communications within DoD. Such special purpose logistics networks as the Marine Corps Data Network (MCDN) and the Defense Logistics Agency Telecommunications Network (DLANET) must also be considered as components of the existing system architecture.

Data system architectures can be categorized into two classes: centralized and *distributed*. The centralized architecture is characterized by a single central computer center that performs all of the processing required by the system. The distributed architecture is characterized by multiple computers, each of which provides some portion of the processing based either on a functional, organizational, or geographic division of tasks.

A.2.a Defense Logistics System Architecture

The current defense logistics system possesses characteristics of both centralized and distributed architectures. It is centralized in that most logistics transactions are transmitted through central sites of DAAS where they are reviewed, routed, and logged. Additional centralized processing occurs where monolithic data bases are maintained for storage of information for a single Service Agency (S/A) or to provide a common system wide function. Examples of these data bases include the Army's Logistics Intelligence File (LIF) and the Federal Catalog System's Defense Integrated Data System (DIDs) maintained by DLA's Defense Logistics Services Center (DLSC).

Distributed processing occurs throughout the logistics system. Distribution of processing is performed on a functional basis [at inventory control points (ICPs), depots, etc.], on a S/A basis, and on a geographic basis at numerous locations throughout the world. To facilitate the analysis of system architectures, the following general categories of functional processing have been identified:

- ICPs – These sites provide the item management, procurement, and accounting functions associated with the logistics system.
- Depots – These sites provide the warehousing and storage functions required for the items managed by the ICPs. In some cases, a depot will support a single ICP. In other cases multiple depots might support a single ICP, or a single depot might serve multiple ICPs.

- Defense Contract Administration Service Regions (DCASRs) – These facilities provide the contract administration, production, quality assurance, and financial management activities associated with the ongoing procurements of the DoD.

- Reutilization and Marketing (R&M) Facilities – These facilities are located at the larger military installations in the United States and overseas. They are responsible for the redistribution, transfer, donation, sale, scrap, or destruction of excess and surplus materiel and equipment.

- Transportation Facilities – These are the ports and airfields associated with the movement of materiel. These facilities are primarily responsible for shipments to and from forces deployed outside the Continental United States (CONUS).

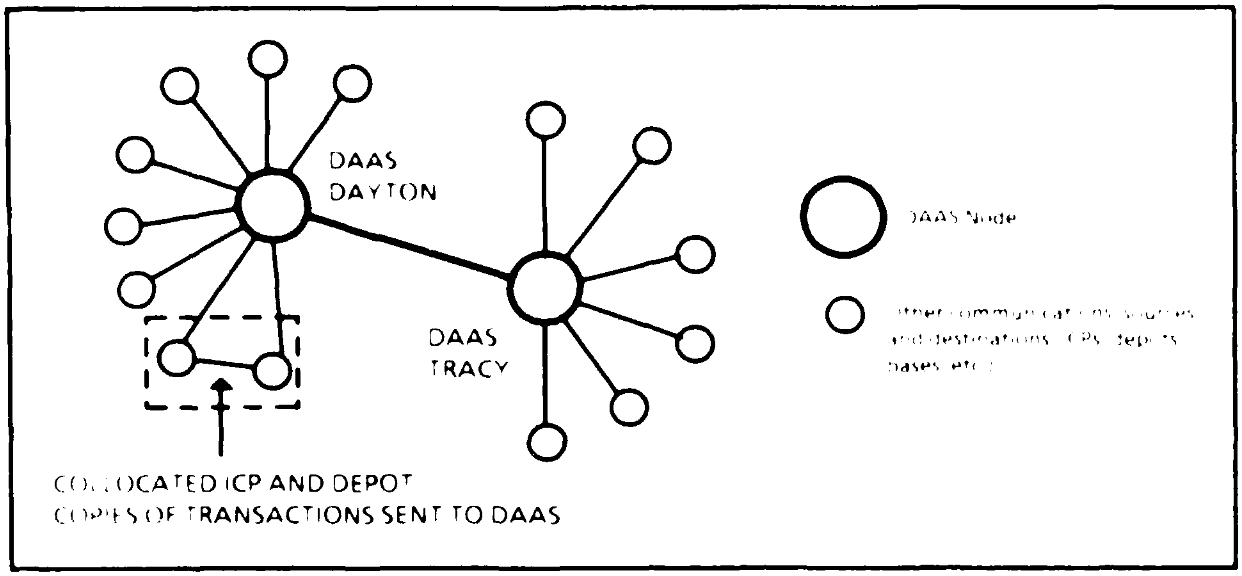
- Retail Sites – A broad range of retail facility types exists within the defense supply system (intermediate and unit level). Some of these sites have responsibility for inventory management, warehousing, and transportation that parallel activities of the wholesale level.

- Customer Sites – Any location (independent of size) that uses materiel managed by the wholesale and retail levels of supply is a customer site. Customer sites include maintenance facilities, military bases, national guard installations, Veterans Administration hospitals, and civilian agencies.

- Specialized Services – A number of specialized services are operated by DLA and the Services to support the defense logistics system. Examples include the DLSC, which maintains the Catalog System, and the Defense Technical Information Center, which provides for storage and distribution of scientific and technical documents.

A simplified version of the existing logistics communication system architecture is presented in Figure A-1. This illustration implies the existence of direct connections between the two central DAAS nodes (at the Gentile Air Force Station in Dayton, Ohio, and at the Western Division in the Defense Depot at Tracy, California) and the various logistics sites. In practice, these connections are made through switched data networks (either AUTODIN or DDN) that provide connectivity between the sites and DAAS.

**FIGURE A-1. EXISTING SYSTEM ARCHITECTURE**




***Note*** [illegible]

DAAS is responsible for performing the basic functions of validation, routing, editing, and maintaining records of most Defense Logistics Standard Systems (DLSS)-related communications that pass between originating and destination sites. DAAS performs the important function of batching different types of documents addressed to a particular destination in a single message. This function reduces the impact of logistics traffic on the AUTODIN and communications centers. Communications between an originating site assigned to one DAAS node and a destination site assigned to the other DAAS node do not pass through both nodes as implied by Figure A-1.

DAAS performs a number of additional special functions important to communications and processing functions of the logistics system, including:

- Maintenance of the Department of Defense Activity Address File (DoDAAF) and the Military Assistance Program Address File (MAPAF), which contain names, addresses, and address codes of activities identified in DLSS transactions.

- Part number to National Stock Number (NSN) and NSN validation editing of all requisitions, making correcting entries when possible.

- Operation of the Defense European and Pacific Redistribution Activity (DEPRA) for processing excess reports, requisitions, and other related supply documents, including overseas redistribution functions. This function is performed at the Dayton, Ohio facility.

- Retention of Military Standard Billing System (MILSBILLS) interfund billing documents on file for 120 days to accommodate requests for retransmission at the Dayton, Ohio facility. The retention period is currently being increased to 1 year.

- Operation and maintenance of the Central Data Collection Point under DoD 4000.23-M, Military Supply and Transportation Evaluation Procedures (MILSTEP). This function is performed at the Tracy, California facility.

- Maintenance of a requisition shipment status correlation file to process Military Standard Requisitioning and Issue Procedures (MILSTRIP) mass cancellation requests and Military Transaction Reporting and Accounting Procedures (MILSTRAP) Materiel Receipt Acknowledgment Documents (MRADs).

- Acting as destination point for logistics documents during periods when MINIMIZE conditions are imposed. (MINIMIZE conditions occur when military operations generate a high level of communications traffic. To reduce the delays experienced by high-priority traffic, all other transmissions are deferred or sent using alternative means such as the U.S. mail.) During these conditions, DAAS receives all requisitions and forwards them in accordance with the requirements of MINIMIZE. This may include the use of mail when the use of AUTODIN is prohibited. DAAS may also be asked to hold all routine transmissions and send only priority transmissions, unless those transmissions have the Joint Chiefs of Staff (JCS) designator in the event of mobilization.

- Termination of Foreign Military Sales (FMS) traffic to and from countries, based on changing diplomatic relationships.

- Response to requests for retransmission of documents received with errors.

- Maintenance for 30 days of an input/output message tape that can be used for tracing specific messages and documents.

- Provision of sources of supply and address information in response to interrogations from various organizations.

- Responsibility for operation and interface with the International Logistics Communications System (ILCS). DAAS personnel are responsible for configuring the on-site ILCS processing equipment. The logistics traffic originating from ILCS sites is received, processed, and routed by DAAS.

- Preparation and distribution of Logistics Information Data Service (LIDS) reports. These reports are extracts from the maintained history records of documents processed by DAAS.

- Provision of special functions for the Services. Examples of these functions include:

  - Transmitting duplicate data for storage in the Army's LIF maintained at Presidio of San Francisco, California.

  - Submitting Materiel Obligation Validation (MOV) responses for organizations unable to prepare their own.

  - Preparing punched cards of transaction responses for Navy ships.

  - Modifying transactions in accordance with specific operating requests of the individual S/As. These modifications are usually performed in response to a request from a S/A that cannot accommodate a modification made to the DLSS.

- Acting as interface between civilian agencies and the defense logistics system. Approximately 10 percent of current DAAS traffic originates from civilian agencies. The major civilian agency users of DAAS are the GSA, U.S. Department of Agriculture, State Department, National Security Agency, Central Intelligence Agency, Federal Bureau of Investigation, General Accounting Office, Coast Guard, National Aeronautics and Space Administration (NASA), and the Federal Aviation Administration (FAA).

- Preparation of special reports as requested by organizations such as the Inspector General, General Accounting Office, and DLA.

- Maintenance of MILSTRIP Supplement 1 Routing Identifier and Distribution codes.

From a communications perspective, DAAS performs gateway and switching functions required to ensure interoperability among the various installations of the defense logistics system. In addition, DAAS accumulates copies of documents and system performance statistics required for effective system management.

A.2.b Exceptions.

Of equal importance to understanding the operation of the current defense logistics system architecture are the exceptions to the configuration just described. As shown in Figure A-1, some logistics installations are collocated. In such cases, direct communications between collocated sites may occur, eliminating the need for using a long communications path in which a message originates at a site, travels to DAAS, and then returns to the same site. An example of this direct communications is the Defense Construction Supply Center (DCSC) in Columbus, Ohio. At that installation, the ICP communicates directly with the depot, bypassing DAAS. However, copies of transactions between the DCSC ICP and the DCSC depot are transmitted to DAAS for archiving and maintenance of performance records.

A second example of intrafacility traffic is the interchange of data between the numerous logistics facilities that exist at the Norfolk Naval Base, Virginia. The activities housed on that base do not follow a consistent policy regarding transmission of logistics traffic through DAAS. The Naval Supply Center (NSC) at Norfolk, Virginia transmits all information through DAAS, even though the destination of those transmissions might also be in Norfolk, Virginia. This procedure is used to take advantage of the routing, error checking, and delivery capabilities of DAAS. However, the Naval Air Rework Facility (NARF) communicates with the NSC using locally leased lines and bypassing DAAS. While it is not unusual for intra-Service customers to communicate directly with their Service ICPs, the result is that information produced in DAAS LIDS reports of data communications activity does not represent the entire defense logistics communications loading. The absence of these data precludes an accurate assessment of the overall performance of the logistics system.

Most Military Standard Contract Administration Procedures (MILSCAP) traffic bypasses DAAS going directly from the source, usually a DCASR, to the

destination, usually an ICP inventory manager (IM). That exception [illegible] the 80-column formats provide insufficient space to include destination [illegible] along with other, more pertinent, contract information.

Much of the traffic data related to the transportation segment [illegible] logistics system bypasses DAAS. For example, Defense [illegible] (DTS) representatives estimated that approximately [illegible] portation Control and Movement Data (ATCMD) are transmitted [illegible] shipper to the appropriate defense transportation clearance [illegible] are prepared for all cargo entering the DTS primarily [illegible] provide the clearance authority with advanced information needed [illegible] scheduling cargo arrivals into DTS and with the necessary information [illegible] and management reports. Plans are underway to test the electronic transmission [illegible] the Government Bill of Lading (GBL), which applies to the movement [illegible] CONUS shipments except for small parcels. These transmissions will not be [illegible] to DAAS.

The fact that transportation shipment data is not transmitted through DAAS facilities can significantly reduce the effectiveness of DAAS as a single DoD [illegible] logistics system performance and status information. The importance of [illegible] logistics information will increase with implementation of on line capabilities for monitoring materiel movement, including detailed transportation shipment status throughout the system. Equally important is the requirement that 100 percent of the shipment status information be provided to the requisitioner. These exceptions must be eliminated to the maximum extent possible by the MODELS design concept.

A.3 Architectural Alternatives.

In view of S/A modernization programs, needed changes to DLSS procedures and transaction formats, implementation of DDN, and communications technology advances, the existing logistics system architecture must be reviewed to determine

[illegible] performing that review is the [illegible] characteristics of those two [illegible] During Phase 3 of the [illegible] and a comparison [illegible] system will be performed.

[illegible] were selected on the basis of the [illegible]

- [illegible] configuration of existing [illegible]

- [illegible] major redesign or [illegible] SAs in the short [illegible]

- [illegible] requirements of the [illegible]

- [illegible] accommodating changes in DLSS [illegible] can be easily implemented [illegible] processing facilities. This [illegible] can be updated at [illegible] DLSS change. However, the archi[illegible] while the change is awaiting [illegible]

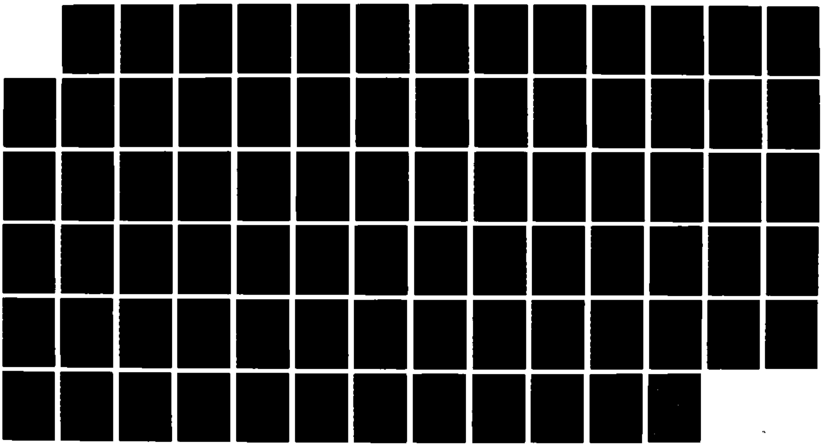
- [illegible] with the current directions of new SA [illegible] increased level of on-line inquiry, [illegible] and increasing levels of automation. It must [illegible] transmitting and receiving graphics data.

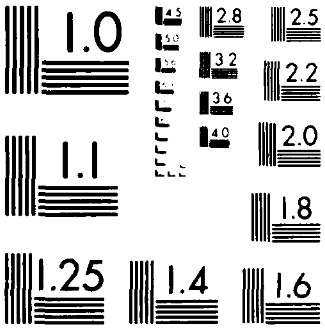
- The system architecture must accommodate all logistics functions – supply, transportation, finance, etc. It must be compatible with logistics activities that are not now within the immediate purview of the DLSS – food, clothing, etc.

- The system must be designed to support planning and operations needs of DoD under both wartime and peacetime conditions.

AD-A180 700 DEFENSE LOGISTICS STANDARD SYSTEMS FUNCTIONAL REQUIREMENTS(U) LOGISTICS MANAGEMENT INST BETHESDA MD P A YOUNG MAR 87 LMI-DL502R1 MDA903-85-C-0139 3/3

UNCLASSIFIED F/G 15/5 NL

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4.0

Using those criteria the following two alternative architectures were developed:

- Multiple switching nodes, to function in a manner similar to DAAS, but located at several additional sites.
- GPs at major logistics installations to serve the unique interface requirements of the installation at which they are located.

Both these alternative architectures are based on the assumption that a central organization is assigned the responsibility for development of software updates and the management of the node configurations and/or the gateway installations. The communication network architectures of these two alternatives are shown in Figure A-2 and are described in detail in the following subsections along with general observations of their advantages and disadvantages.

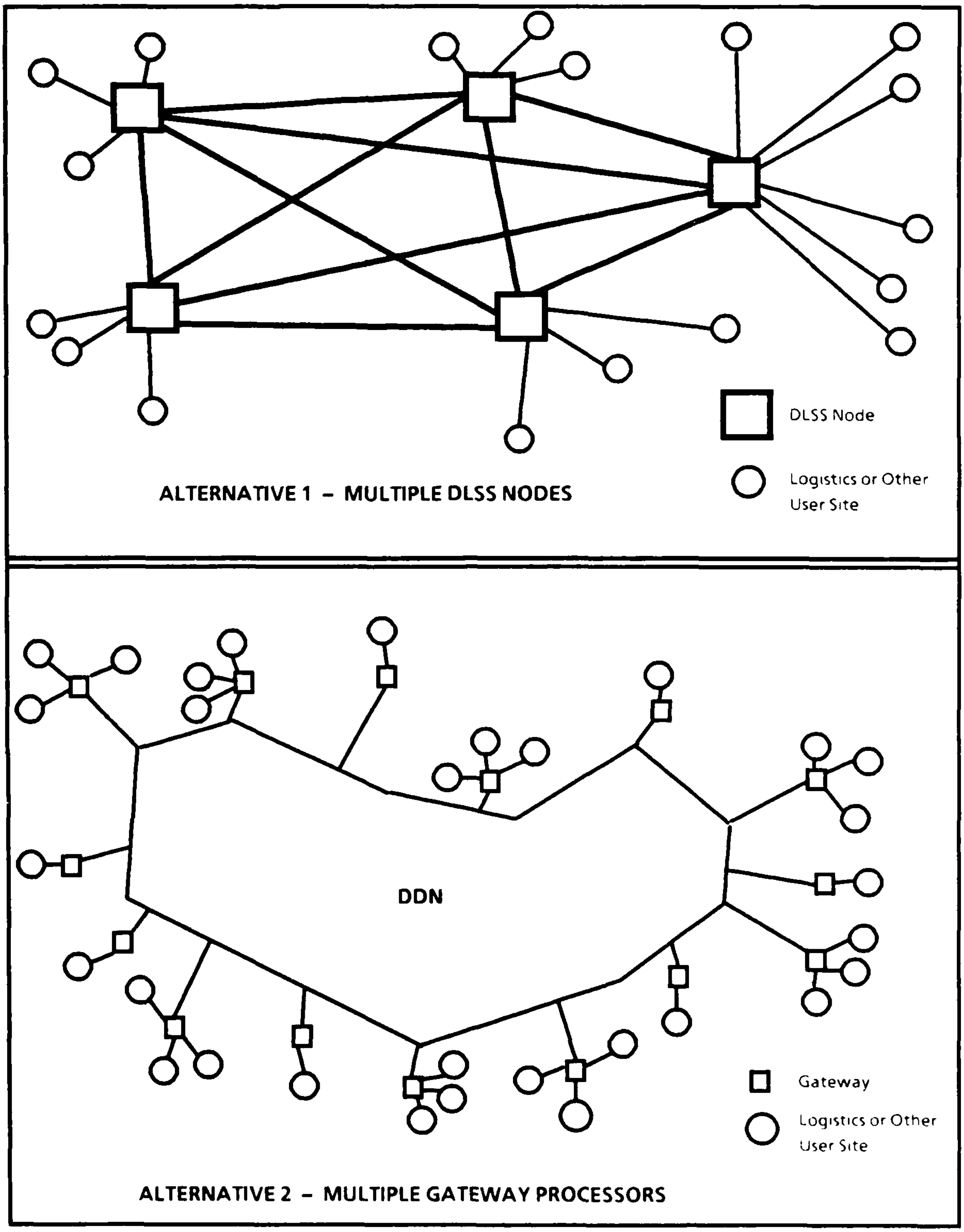
A.3.a <u>Alternative 1 – Multiple Switching Nodes</u>.

Alternative 1 operates in a similar manner to that of the existing system. The difference is that the two DAAS sites are augmented by additional DLSS nodes. Each node provides the basic functions of routing, error checking, document storage, and report processing performed by the existing DAAS sites.

To siinplify configuration management of the overall system, all nodes are functionally identical. However, special responsibilities are assigned individual nodes (for example, DEPRA) for reporting of overall logistics system performance measures via MILSTEP.

Each node serves a specific geographic region and is designed to back-up other nodes. The geographic assignment of logistics sites to a specific node minimizes transmission distances between sites. Vulnerability is reduced by providing back-up capability. The DLSS nodes are installed at existing logistics installations to minimize the costs of acquiring new facilities to house equipment and personnel. DDN facilities are used to provide internode communications required for

FIGURE A-2. ALTERNATIVE ARCHITECTURES



transmission of data base updates, back-ups, and exchange of administrative information.

The architecture of this alternative is similar to that of the public telephone system, in which each central office serves the subscribers in a geographical area in a star configuration, while all central offices can communicate directly with each other. This alternative provides advantages similar to those of the public telephone system. It offers a potentially high level of system reliability and reduced vulnerability because the nodes can back up each other. It also offers the potential to reduce total transmission distance because of the proximity of the nodes to the customers served.

A possible disadvantage of this alternative is the administrative complexity of maintaining identical configurations at multiple installations. Effective configuration management of these nodes requires the use of strict controls, carefully administered by a central site. A second disadvantage is an increase in computer facility costs that is directly related to the number of nodes implemented.

A.3.b Alternative 2 – Gateways.

Alternative 2 is implemented using GPs at wholesale logistics activities (ICPs, depots), DCASR offices, transportation facilities, and major intermediate retail-level activities. The GPs ensure that all interfacility traffic entering the DDN is formatted using a single standard consistent with the transaction format requirements of the DLSS.

The GP replaces many functions currently performed by DAAS including routing, formatting, specialized interface processing, file maintenance, and accumulation of traffic statistics. Collocated facilities are served by a single GP. Similarly, customer sites too small for installation of a GP at their own facility access the logistics network through the nearest GP.

In this alternative, communications between two logistics facilities is performed in the manner indicated in Figure A-3. The message begins at a terminal in the originating facility. The terminal communicates with the host computer system of the organization to which the terminal is assigned. If the host computer system requires additional information to respond to the terminal inquiry, it transmits a request for information to the GP which performs the following functions:

- Translation (if necessary) from the inquiry language of the host to the common DLSS inquiry language.
- Routing of the inquiry through DDN to the correct destination.
- Transmitting additional inquiries to other destinations if the first destination does not have the required information.

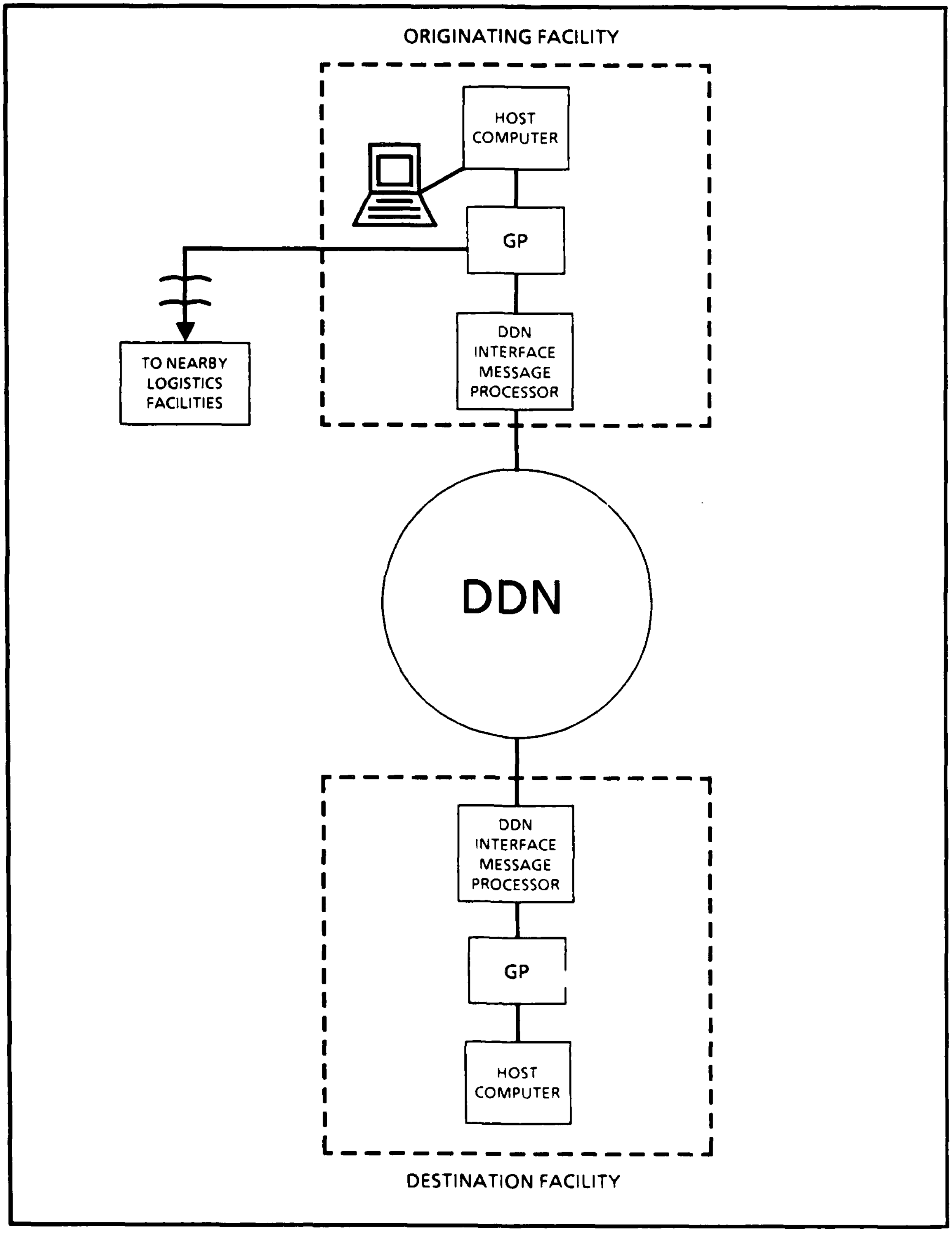
GPs are implemented in a manner that permits software updates and data base interrogation from remote locations. This feature of the design enables a central design/programming organization to manage the configuration of all gateways. It also permits centralized acquisition of data collected by each GP.

Alternative 2 does not represent merely breaking DAAS into small systems and installing it at individual logistics sites. The two significant differences that exist between this alternative and the DAAS architecture are as follows:

- The GPs of Alternative 2 are not identical but are tailored to the requirements of the S/A site at which each is installed. When a GP serves multiple S/A sites, it includes appropriate modules for each S/A supported. This concept reduces the complexity and equipment costs of the GPs.
- The outgoing and incoming transactions are translated (if necessary) into the language of the S/A-site host computer.

As indicated in Figure A-3, the GPs directly interconnect host computer facilities with each other. All communications between GPs is in a common, standard DLSS format. Also, as indicated in Figure A-3, the GPs support nearby logistics

**FIGURE A-3. TYPICAL COMMUNICATIONS BETWEEN LOGISTICS FACILITIES – ALTERNATIVE 2**



installations that may communicate with the GP using leased lines, dial-up facilities, or DDN.

The GPs could also support direct terminal connections. While that capability may be desirable because it bypasses major host installations, it could have a significant impact on the size and complexity of the GP. This possibility will be examined during Phase 3 of the MODELS project.

The concept shown in Figure A-3 is similar to the manner in which DDN operates. GPs administered by the Defense Logistics Standard Systems Office (DLSSO) and managed by a centralized organization such as the Defense Automatic Addressing System Office (DAASO) would be installed at a logistics site to provide the interface between the local logistics processor and other logistics installations in the same manner as the centrally managed DDN processors provide interfaces between the data processing facility and the communications network.

The procedures used by retail customers to access the GPs and other elements of the wholesale system would be the same as those currently in use for retail-level access to the wholesale system. Intra-S/A communications would be unaffected by this alternative and would not require a GP for intra-S/A retail/wholesale communication.

All communications traffic is transmitted directly from origin to destination without the need for routing through an intermediate destination.

The GPs *do not* provide the on-line centralized data base management functions provided by the existing system and Alternative 1. Instead they provide access to the distributed data bases located at the installations at which data originate. This design represents a significant departure from concepts that are currently used. On-line response times to inquiries for this alternative will be a function of response times of the host computers whose data bases are being interrogated. Thus, it will be

important to include an electronic mail capability, so responses can be deposited in the mail box of the terminal initiating an inquiry.

Alternative 2 appears to offer a number of advantages over both the existing DAAS system and Alternative 1. The architecture offered by this alternative guarantees that the GPs will capture all traffic entering or leaving the logistics installation. As a result, the quality of performance data recorded by these devices will be significantly improved over that available from the other two architectures.

It is anticipated that six types of nodes would be implemented; one for each of the Services, one for DLA, and one for civilian agencies. This level of flexibility permits accommodation of the unique change schedules and capabilities of individual S/As. It also provides a method for assessing the cost of S/A-unique modifications to the S/A requesting them.

Alternative 2 also minimizes communications costs by permitting direct communications from origin to destination. It eliminates the processing delays and costs associated with the routing of all communications through an intermediate point.

A final advantage is that the Alternative 2 approach minimizes system vulnerability since failure of an individual GP would only disable the logistics facility to which it is connected.

Some disadvantages are also associated with this approach. The complexity of numerous GPs installed throughout the world might result in significant administrative difficulties. Since configurations will not be identical, it may be difficult and time-consuming to provide the configuration management required to accommodate data base updates and ongoing software enhancements.

All of the advantages and disadvantages along with economic considerations will be analyzed and evaluated in greater detail during Phase 3 of the MODELS project.

# CHAPTER B: TELECOMMUNICATIONS ISSUES AND DATA BASE MANAGEMENT SYSTEM CONSIDERATIONS

## B.1 Telecommunications Issues.

The ability of the defense logistics community to operate effectively in a changing technological environment depends on the quality of service provided by the data communications system. Existing communications services are provided from a number of sources including:

- The AUTODIN system that provides message-switched data transmission services worldwide for DoD. AUTODIN is used as the primary data communications service for transmission of logistics documents.

- Dedicated communications networks for on-line inquiries into logistics data bases include the DLANET and MCDN. The transmission facilities for both these networks are American Telephone and Telegraph (AT&T)-leased Dataphone II service providing 9,600 bits per second (bps) digital communications service using dedicated lines. The terminal devices used to access this AT&T service are International Business Machines Corporation (IBM) 3270 terminals or their equivalent. Data switching and interfacing with IBM-compatible host computers is provided by NCR Comten processors. These processors provide message switching capabilities.

- Voice dial-up services, including the AT&T direct dial network and the Automatic Voice Network (AUTOVON), are used to access facilities, using low-speed terminals equipped with modems. These services are primarily used for on-line inquiry and low volume transactions, such as communications between individual users and retail facilities.

- Dedicated leased lines are used to provide data transmission between facilities located on the same base or within the same city. Communications over leased lines is performed at low-speed using modems.

- The DDN, currently under development, will provide the DoD with the next generation of data communications services. DDN will replace some communications services currently in use. The first operational applications of the DDN facilities for transmission of logistics data will be for communications between the two DAAS sites and for a limited number of Navy installations, at which Stock Point Logistics Integrated Communications Environment (SPLICE) equipment is now installed. Most major users,

including MCDN and DLANET, are planning to use DDN in place of their existing transmission network facilities.

The transition to DDN offers the opportunity to introduce expanded flexibility and increased capabilities over that currently existing. However, use of DDN requires a thorough understanding of its limitations and unique operating concepts to ensure that requirements of the defense logistics community are satisfied. This section discusses issues associated with the transition from use of the existing system to the DDN.

B.2 Traffic Growth.

During the next 10 years, logistics data communications traffic is expected to increase significantly. The increases will result from normal growth in logistics traffic, improved on-line access to automatic data processing (ADP) equipment, new requirements for data transmission between facilities (for example, exchange of information between transportation facilities), removal of the existing 80-byte (card column) limitation on transaction document size, and the transmission of graphics data. While it is difficult to determine the impact of each factor precisely, it is important to develop planning estimates to avoid the potential problem of degraded service because of communications capacity limitations. These estimates are particularly important because current logistics traffic is approximately one-third of all defense AUTODIN data traffic.

The manner in which these traffic growth forecasts have been developed is discussed in the following paragraphs.

B.2.a On-Line Processing.

The existing procedure of providing requisition and shipment status using batch processing procedures is assumed to continue even after on-line capabilities are provided. These batch-processing procedures are implemented through retail-level ADP systems interrogating ICPs about the status of all active requisitions at

time intervals specified by the Uniform Materiel Movement and Issue Priority System (UMMIPS). The assumption of continued automated (batch) interrogation of logistics files is based on the facts that batch systems currently incorporate this capability and that Services will be unwilling to operate without it. Data acquired from batch transfers is designated "pushed data."

On-line inquiries about requisition status, item availability, and catalog data will represent an additional source of data traffic. These inquiries are needed to acquire information not available at the retail level. For that reason, on-line traffic will be added to the existing batch traffic rather than replacing it. On-line traffic has been assumed to equal 2.23 times[1] the existing batch traffic for follow-ups, supply and shipment status requests, and DAAS interrogations. Data resulting from on-line inquiries is designated "pulled data."

B.2.b New Requirements.

Major unsatisfied requirements are yet to be defined for the data communications required to improve the capability for monitoring shipment status of materiel from origin to destination and to improve the ability of DTS facilities to plan, schedule, and control shipments. The specific changes anticipated are the use of an electronic GBL that would have applications for most CONUS shipments and the increased use of DDN for the transmission of ATCMD or similar data for shipments outside the Continental United States (OCONUS). Thus, it can be assumed that additional electronic transactions will be transmitted for most

[1]The factor 2.23 was derived from the data presented in *Solicitation Document – Acquisition of Computer Systems and Support Services for the Stock Point ADP Replacement (SPAR) Project*, Department of the Navy, Automatic Data Processing Support Office (ADPSO) Project No. 84-25, Attachment 9, Washington Navy Yard, Washington, D.C.

shipments. These additional transaction transmissions will occur each time a shipment is processed by a node of the transportation system.

Assuming that on the average, 10 requisitions are consolidated into a single shipment unit, and that two (or more for OCONUS shipments) transportation transactions (data records or documents) are generated for each shipment unit, the total number of additional transactions will equal 20 percent of the number of requisitions. This assumption is used to forecast traffic growth related to transportation transactions.

Additional traffic growth is likely to occur through the increased use of MILSCAP documentation related to contract activities. However, the current level of this traffic is so low relative to other logistics traffic that it can be assumed to have a negligible affect on total traffic load.

B.2.c Variable-Length Messages.

The replacement of the fixed 80-column format with a variable-length format offers the potential for reducing the total amount of data that is transmitted. This reduction would result from not needing to provide multiple copies of the same data field when more than one 80-column card image is required for a document. These multiple copies are now necessary to permit identification of continuation cards in the event that the card-set becomes separated.

However, experience shows that the increased flexibility associated with variable-length formats leads to an increase in total data, which results from the fact that information now not included in existing fixed formats is included in the variable-length, more flexible format. In addition, the variable format offers flexibility for including textual comments, resulting in still more data being transmitted. Finally, in some variable formats, information required for message destinations to identify blank fields (such as a series of field delimiters containing special characters) leads to additional data transmission.

For these reasons, a 20 percent increase in current average document length is forecast. While this estimate does not affect the number of documents transmitted, it changes the average document length from 80 to 96 bytes per document.

B.2.d Graphics Data Transmission.

Plans are underway for transmission of graphics data to supplement logistics text and data currently being transmitted. While estimates of the number of bytes to be transmitted for a single graphic are readily developed, the applications of these data are not fully defined. Since the amount of data associated with a single graphic can be extremely large, depending on the size of the graphic and the desired resolution, the transmission of graphics will probably be restricted to a limited number of documei ' types.

Graphics data will probably be used under the following conditions:

- Some procurement transactions will be accompanied by a graphical description of the materiel to be procured. This description will be used to assist the negotiator in the determination of a reasonable price for the contract. It is likely that such graphics data would be acquired from a new data base to be added to the existing catalog data. Therefore, the retrieval of catalog data would, on occasion, be accompanied by the retrieval of graphics data.

- A modernized MILSCAP encompassing procurement functions would include transmission of graphics information associated with solicitations when that information was available.

- Supply system customers who desire verification that the item being ordered meets their technical requirements might, on occasion, require the transmission of supplementary graphics data during retrieval of catalog information.

Using these conditions, it is likely that use of graphics data would gradually increase as it is added to the DIDS Federal Supply Catalog data base. Since the schedule of these types of improvements is uncertain and the applications of graphics data have not been identified, they are not used in the traffic analysis model associated with this report.

However, an estimate of the magnitude of the impact of graphics data can be made assuming that such data are added to 20 percent of all modernized MILSCAP solicitation documents and 10 percent of requests to the DIDS data base for catalog information and, that the average graphics transmission requires 50,000 bytes. Under these assumptions, the total logistics traffic will increase by 4 percent, or an estimated annual increase of more than 200 million bytes in traffic, as a result of the use of graphics data during the next 5 years.

Traffic at specific locations will increase by an even greater amount. For example, DLSC in Battle Creek, Michigan, which currently responds to the majority of catalog data requests, will be significantly affected by the transmission of graphics data. Thus, it is important that the future graphics data transmission requirement be considered during planning and design of communications facilities at DLSC, Battle Creek, Michigan.

B.2.e Total Traffic Growth.

The impacts of each source of traffic growth (on-line inquiries, new requirements, variable-length records, and graphics data) are summarized in Table B-1. In addition to this increase, communications requirements can be expected to increase at a compounded rate of approximately 5 percent per year. This rate of growth has been experienced for the past 5 years and is anticipated to continue in the future. Table B-1 shows that normal growth and the changing logistics environment will increase the level of logistics traffic by a factor of approximately 3.

These capacities are based on peacetime logistics traffic. Significant additional capacity must be available to allow for the increase in traffic that would occur during wartime conditions. The AUTODIN has an operational condition known as MINIMIZE, which requires that all nonessential traffic be removed from the network during periods of national emergencies. In the past, logistics traffic has been considered nonessential, with the result that most supply system traffic is

**TABLE B-1. ESTIMATED INCREASES IN LOGISTICS TRAFFIC OVER EXISTING TRAFFIC**

**(57.3 million documents equal to 4.58 billion bytes of data)**

| LOGISTICS SYSTEM TRAFFIC INCREASES DUE TO: | 10-YEAR INCREASE IN TRAFFIC | |
|---|---|---|
| | Billions of Monthly Bytes | Percent Increase |
| Normal Growth | 2.89 | 63 |
| On-Line Capabilities | 1.93 | 42 |
| Graphics Data | 0.18 | 4 |
| New Requirements (Transport and Contracts Documents) | 0.05 | 1 |
| Variable-Length Records | 0.92 | 20[a] |
| Combined Impact of All Increases | 13.37[b] | 2.92[b] |

[a] Variable-length records will not change the number of documents but are assumed to increase the average document length (number of bytes) by 20 percent.

[b] Percentage and total represent compounded growth of each increase factor on base

removed from the network during MINIMIZE conditions. To provide effective support for military operations with reduced levels of supply (inventory in motion), this situation must be corrected.

Increased reliance on automation requires that future communications system designs be adequate to accommodate logistics requirements during wartime conditions. It is likely that in the future, the defense logistics system will be unable to operate without continued access to data communications services.

On the basis of this analysis, close coordination must be maintained between the representatives of the defense logistics community and DCA. This coordination is essential to provide the adequate communications capacities needed to ensure the availability of logistics support services under all conditions.

B.3 Communications Charges.

At the present time, the Services and DLA are contributing funds to DCA for the implementation of the DDN. That funding is based on a fixed assessment developed during the early phases of the system's implementation.

However, a tariff structure will be established for DDN in which "subscribers will be billed based upon their actual use of the network's facilities. It is anticipated that costs will be less than those of public data networks providing similar services, and much less than those of dedicated facilities. Billing algorithms that implement cost-by-use tariff structures are normally sensitive to such parameters as time of day, message size, and traffic type."[2] The same document indicates that "Project managers who optimize billing parameters in a manner consistent with mission objectives will effectively reduce their data communication costs."

Because of the volume of data communications traffic transmitted by the logistics community, the costs of overall system operation will be sensitive to the manner in which the tariff structure is defined and the architecture of the data communications system.

B.3.a Tariff Structure.

Although the DDN tariff structure has not yet been established, it is likely to include similar components used for the tariff structures of commercial systems including:

- Access to Service – Some commercial value-added networks offering packet-switched services include the cost of the communications line between the customer's facility and the nearest switch or concentrator with the monthly lease cost of the port. In other cases, acquisition of this access

[2]*Transitioning to the Defense Data Network: A Management Checklist*, Prepared for the Office of the Assistant Secretary of Defense (Manpower, Installations, and Logistics), November 1984.

is the customer's responsibility. In still other cases, the access is provided by the supplier of value-added services but is billed as a separate monthly charge. It would be beneficial to logistics users if the DDN rate structure included the local access arrangements. This factor is particularly important for military bases at which logistics facilities are collocated with other military units. A DDN-provided access service would minimize the possibility of duplicate access facilities being leased by the various facility tenants.

- Port Charges – These charges are incurred monthly. In most cases, they include the cost of the port and any interface equipment such as packet assemblers/disassemblers (PADs) and modems required to access the service. In most cases, these charges vary with the communications data rate. However, it is significant to note that the charges do not vary linearly (i.e., doubling the data rate does not double the monthly charge). When the rate structure for DDN is established, the DCA must determine the relationship between port charges and data rate. Since most wholesale-level logistics facilities transmit and receive large volumes of data, it would be beneficial to the logistics community if this nonlinear relationship were maintained.

- Usage Charges – Usage charges are incurred in proportion to the amount of data transmitted. These charges are calculated on the basis of the number of kilopackets (1,000 packets of approximately 128 bytes of data) transmitted. A comparison of the costs of the various commercial services (shown in Table B-2) indicates that each service tends to allocate costs between port charges and usage charges in a different way. For example, AT&T charges more for ports and less for usage than Tymnet. In this example, high-volume users benefit from the AT&T charges. Again, it would be beneficial to the logistics supply community if DCA developed a tariff structure that was favorable to high-volume users.

It is evident from this discussion that close coordination should be maintained between representatives of the defense logistics community and DCA. However, equally important is the design of a communications network system architecture that recognizes the advantages to be gained from efficient use of the communications system.

**TABLE B-2. COMPARISON OF RATE STRUCTURES**

| RATE ITEM | AT&T ACCUNET | GTE TELENET | MCDONNELL/ DOUGLAS TYMNET |
|---|---|---|---|
| Access to Service | Customer Provided[a] | Dedicated Access Included in Port Charges | $1,200 for 9.6 kilo-bytes per second (kbps) Access |
| Port Charges for 9.6 kbps Access | $615/mo. | $1,525/mo. | $535/mo. |
| Usage Charges in $/kilopacket[b] | $0.67 | $1.19 | $1.28 |

[a] Customer options for service access include either voice lines or data lines. If data lines are desired, AT&T DATAPHONE Digital Service would be acquired. Typical monthly costs for this service would be $175 plus $.60 per mile for 9.6 kbps service.

[b] A kilopacket equals 1,000 packets. A majority of services use 128 bytes as the average packet size.

### B.3.b MODELS Consideration.

An important consideration in the development of the MODELS network architecture is the influence of the DAAS operation on communications costs. The transmissions from the transaction-originating source to DAAS and from DAAS to the transaction's destination effectively double the total amount of data that are communicated. In addition, the interconnection of the DAAS facilities with DDN will result in the need for additional ports and access lines, a factor that will further increase communications costs. However, as noted in the Chapter A discussion of system architectures, total system costs (including both communications costs and processing costs) must be considered when considering alternatives to the existing architecture.

### B.4 Logistics Data Networks.

A number of data communications networks are operational or under development for on-line access to logistics data bases. They include DLANET and MCDN, operated by DLA and the Marine Corps, respectively.

Both DLANET and MCDN provide a combination of transmission and switching services that will be replaced by DDN. As a result, their role is likely to change significantly, from providing communications network services to providing front-end processing services required for access to the host computers of their organizations. Organizationally, therefore, the technical capabilities they offer should include a greater emphasis on computer and Local Area Network (LAN) capabilities, and a reduced emphasis on long-distance communications and network monitoring.

The technological issues associated with the anticipated DLANET and MCDN responsibilities will be similar to those currently being addressed by the Air Force's Logistics Network (LOGNET) program. That program includes (1) implementation of intersite gateways with DDN and AUTODIN, (2) installation of LANs to interface host computers at the Air Force Logistics Command (AFLC) and the Air Logistics Centers (ALCs), and (3) development of intelligent gateway processors (IGPs). These components will be integrated into networks providing single points of access to all data bases and intersite communications facilities of the Air Force logistics community. The IGPs will enable personnel to communicate with a number of different logistics systems using a single command-and-inquiry language.

This discussion of the LOGNET program is not intended to advocate the approach being used by the AFLC but rather to provide an example of the types of communications services that must be made available at local installations to accommodate the growth in data traffic resulting from changes being made to the defense logistics system. It is important that the S/A identify the changes required at their host facilities so that those facilities can provide the levels of service required by the enhancements to the logistics system discussed in this report.

# CHAPTER C: DATA BASE MANAGEMENT

## C.1 Background.

In 1981, the Federal Government had more than 15,000 installed computers, approximately 50 percent of which were less than 5 years old. The National Bureau of Standards (NBS) estimates that a majority of those Federal computers could support a DBMS. Notwithstanding that potential, only about 3,700 DBMSs were in use in the Federal Government in 1981. By 1986 at least 28 percent of the computers will have installed some type of DBMS. By 1990, the Federal Government is projected to have more than 40,000 computers. Of those Federal computers acquired in the 1985 – 1990 timeframe, most will install some type of file or data-management capability. These projections imply that by 1990, the Federal Government could have more than 30,000 Data Management Systems (DMSs) and DBMSs, roughly a 10-fold increase over the 1980/1981 estimate.

A significant number of logistics systems in every Service and in the DLA are utilizing DBMS technology. The MODELS system design concept is certain to include DBMS technology to facilitate the flexibility needed in the next generation of the DLSS, both to accommodate logistics operational changes and to incorporate the variable-length record/variable-field record discussed in Part II, Chapter D.

Given the potential that over 30,000 data-management related packages will be selected and implemented in Federal data-processing facilities by 1990, responsible information managers will need assistance in making cost-effective selection decisions. Even if these data-management facilities are "included" in a system acquisition, the decision to use one capability versus another can have enormous cost/benefit implications.

This chapter provides an introduction to the extent of DBMS use already ongoing in the DoD and discusses development efforts for interfacing heterogeneous distributed data base management systems (DDBMSs), a vital factor in realizing the full potential of modernized logistics management systems in the S/A.

C.2 Data-Management Approach.

A great number of data-management approaches exist, ranging from traditional application systems (usually programmed in COBOL) to DBMSs (integrated systems, that permit sharing of available data, shared data resources utilizing data dictionaries, query languages, report writers, telecommunications software, and other features). The various commercial packages or groupings of packages can be categorized under three major data-management approaches:

- Traditional application systems
- DBMSs
- DMSs.

These three approaches are representative of the three major strategies now being used for data management.

This discussion concentrates on DBMSs and their use in the DoD community. The central design activities for each of the Services and DLA were contacted for a list of the DBMSs used in major DoD logistics systems. Other organizations were contacted as well since a large number of organizations in the Services procure hardware and software independently. A discussion is also presented of the heterogeneous DDBMS efforts underway in the Services.

Standardization efforts, both commercial and Federal, for various DBMS-related activities are discussed in Appendix D. NBS is playing a major role in this area, working closely with various American National Standards Institute (ANSI) groups.

This discussion of DBMS applications demonstrates the current emphasis within the logistics community on the use of generalized packages. It also demonstrates an increasing level of research and development (R&D) into the development of DDBMSs capable of accessing heterogeneous data bases at dispersed locations.

Although these trends are encouraging in that they demonstrate the application of modern software technology to the problems of logistics data management, they are also alarming because of the diversity of software packages being used. This diversity further highlights the importance of the DLSS if interoperability between systems is to be maintained.

C.3 DBMSs Used by the Services and DLA.

Table C-1 provides a list of DBMSs currently in use or planned for logistics applications by each Service and DLA. Primarily, commercial DBMS packages are listed here. The trend in all the Services and DLA is away from the tendency to develop home-grown DBMSs or file management systems, toward commercially available DBMSs. The use of off-the-shelf products helps to ensure that software can be maintained in a cost-effective manner and increases the ability to accommodate system upgrades.

An Army study group is currently evaluating DBMSs for use in mainframe environments. Nomad II is a user-oriented relational DBMS used today on IBM equipment for information-retrieval applications. The Army is looking for a relational DBMS to be used in its production environment. The Army is also sponsoring the development of a prototype common data language for retrieving data from heterogeneous DBMSs.

The Naval Supply Systems Command (NAVSUP) is currently funding a major system modernization effort in which the UNIVAC 494 computers are being replaced with IBM 3080 computers using Tandem computers as front-end processors (FEPs). DBMSs are a critical component of the NAVSUP effort. A study is

## TABLE C-1. DATA BASE MANAGEMENT SYSTEMS IN THE DoD COMMUNITY

| SERVICE | DBMS | HARDWARE |
|---|---|---|
| Army | Datacom DB | IBM |
| | DMR | IBM |
| | Informix | Unix-based minis |
| | Mistress | Unix-based minis |
| | Nomad II | IBM |
| | System 2000 | IBM |
| | TOTAL | Perkin-Elmer |
| Navy | Encompass | Tandem |
| | FOCUS | IBM |
| | IDMS | IBM |
| | IDS II | Honeywell |
| | Model 204 | IBM |
| | System 2000 | IBM |
| | TAPS | Perkin-Elmer |
| | TIS | Perkin-Elmer |
| | TIS | IBM |
| | TOTAL | Perkin-Elmer |
| | TOTAL | IBM |
| Air Force | ADABAS | IBM 3083 |
| | CONDOR | Zenith 100s |
| | Datacom DB | NAS 3000/5000 |
| | dBase II | Zenith 100s |
| | DGDBMS | Data General |
| | DM-4 | Honeywell DPS 8 |
| | DMS 1100 | Sperry |
| | ENFORM | Tandem 16 |
| | FOCUS | IBM 4341 |
| | IDMS | Magnuson M80/43 |
| | IDS | Honeywell DPS 8 |
| | IMS | Amdahl V8 |
| | IMS | IBM 4341 |
| | IMS | IBM 3083 |
| | INGRES | PDP 11/70 |
| | INGRES | VAX 11/780 |
| | Mapper | Sperry |
| | Model 204 | IBM 4341 |
| | System 2000 | Cyber 170 |
| | TOTAL | DEC PDP 11/70 |
| Marine Corps | ADABAS | IBM |
| | FOCUS | IBM |
| DLA | ADABAS | IBM |
| | dBase II & III | IBM |
| | dBase II & III | Zenith |
| | DMS II | Burroughs |
| | DMS 1100 | Sperry |
| | Encompass | Tandem |
| | IMS | IBM |
| | Model 204 | IBM |
| | SEED | IBM |
| | TIS | IBM |
| | TOTAL | VAX |
| | TOTAL | IBM |
| | TOTAL | Perkin-Elmer |
| | Unified DB | Gould |

underway to examine a representative sampling of DBMSs that subscribe to the Conference on Data Systems Language (CODASYL) data model concept to determine the most portable subset of facilities within the CODASYL data model. Since the Navy has procured the IDMS DBMS, a subscriber to the CODASYL data model concept, a specific subset of IDMS has been recommended for use by the Navy to maximize portability. A further discussion of this effort is presented in Appendix D.

Marine Corps operations are currently supported on IBM mainframes, IBM personal computers (PCs), and Amdahl equipment. ADABAS is the DBMS used in the mainframe environment, while FOCUS is used on the PCs.

C.4 <u>Heterogeneous DDBMS Management Efforts</u>.

Four prototype developments for interfacing heterogeneous DDBMS are currently underway in DoD.

The Army has contracted with Computer Corporation of America (CCA) to adapt its MULTIBASE system to act as a front-end software package for two data bases: System 2000 DBMS and the Data Manager Routine (developed by the Army). The MULTIBASE software will run on a separate FEP.

A second contract, funded by AFLC, involves the development of a prototype MULTIBASE front-end for the integrated design support system, which will provide design, manufacturing, and engineering data for the development of weapons systems. This system is being developed by CCA as a subcontractor to Rockwell International, the prime contractor for the B-1 bomber development. Interfaces must be provided for the AFLC and the many other second- and third-tier subcontractors involved in the B-1 program. Users will include the Air Force, aerospace contractors, and subcontractors. The data bases will contain proprietary information.

The Integrated Manufacturing Distributed Database Administration System is a prototype software system that provides update and retrieval services over

preexisting, distributed, heterogeneous files and data bases. The project is being sponsored as part of the NBS Advanced Manufacturing Research Facility and is being conducted by NBS in Gaithersburg, Maryland, along with the University of Florida. The Advanced Manufacturing Research Facility at NBS is being constructed as a testbed for research in the automation of small batch manu-facturing systems, in particular for systems producing machined parts in lots of 1,000 or less. Construction started in late 1981, and by late 1986, the testbed will be made available for selected research by academic and industrial organizations, research institutions, and Government agencies. The project is funded by NBS and the Navy Manufacturing Technology Program and is significantly supported by industry through donations or loans of major components and through cooperative research programs.

The Integrated Information Support System is a software system being developed by the Air Force. It achieves control of and access to information in preexisting, distributed, heterogeneous data bases to allow data shareability and to provide a means for improving data quality and data timeliness. Engineering, manufacturing, and business applications will be supported. Integrated Information Support System research is being conducted by Boeing, D. Appleton Company, the Structured Dynamics Research Corporation, and Control Data Corporation under contract with the U.S. Air Force at Wright-Patterson Air Force Base in Dayton, Ohio.

Research efforts are under way at the Laboratory of Database Systems Research, Naval Postgraduate School in Monterey, California, for the development of a Multi-Lingual Database System. This approach enables the user to access and manage a large collection of data bases via several data models and their corresponding data languages without the restriction of a single data model and a specific data language. A specification has been presented for the implementation of an

interface that translates Structured Query Language (SQL) calls into attribute-based data language requests. The design goals involve developing a system that is accessible via a relational/SQL interface, a hierarchical Data Language I interface, a network/CODASYL interface, and an entity-relationship/Daplex interface. Additional details describing those activities are presented in Appendix D.

# MODELS – APPENDICES

A: OPEN SYSTEMS INTERCONNECTION MODEL

B: INFORMATION RESOURCES MANAGEMENT PLAN OUTLINE

C: COMMUNICATIONS TRAFFIC MODEL

D: DATA BASE MANAGEMENT

E: GLOSSARY

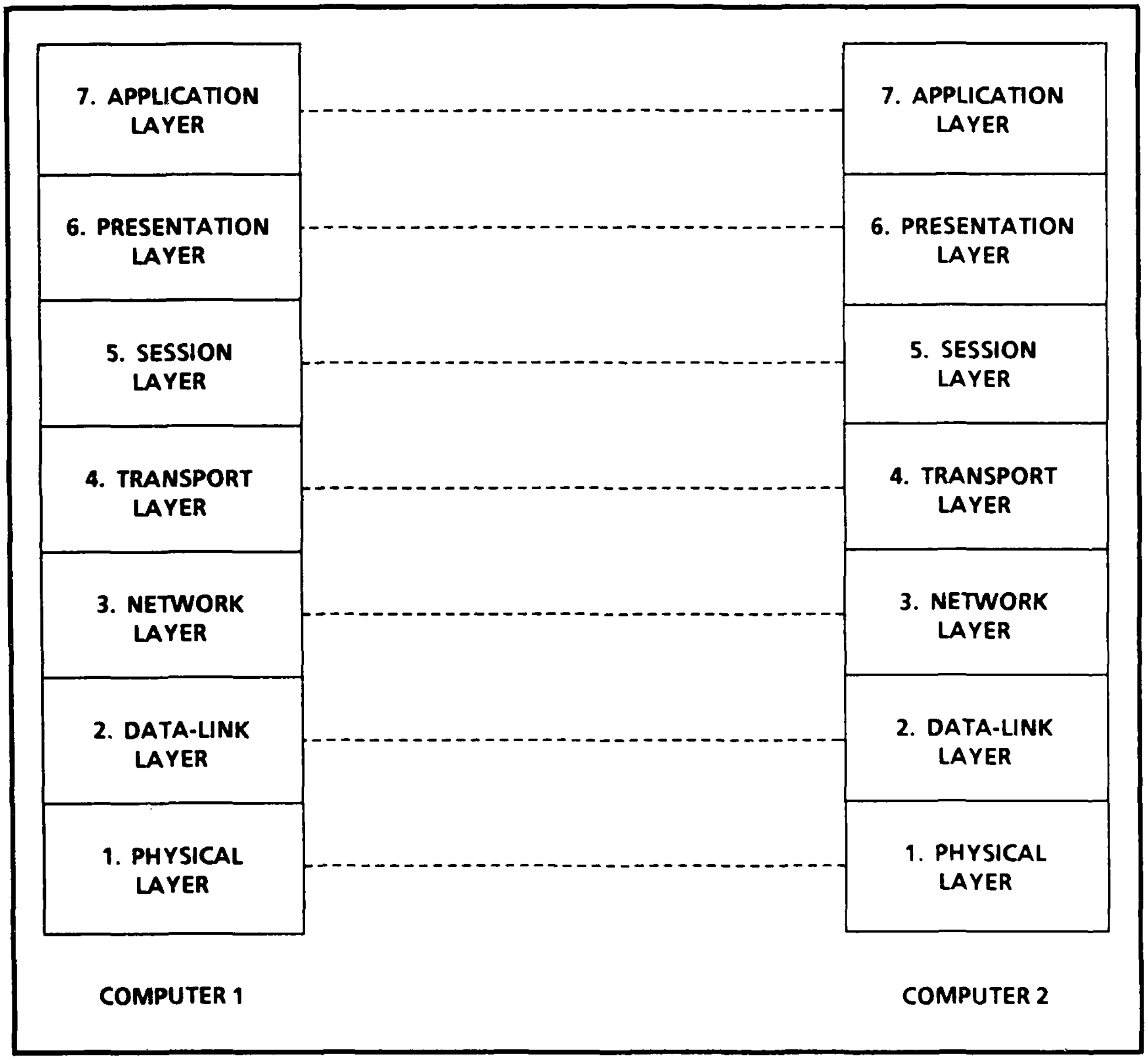
## APPENDIX A: OPEN SYSTEMS INTERCONNECTION MODEL

In 1977, the International Standards Organization (ISO) established a subcommittee to develop an architecture for defining processing functions performed in a data communications system. This subcommittee produced a model known as the Open Systems Interconnection (OSI) model that serves as a framework for defining standards for linking heterogeneous computers. The OSI model uses a structuring technique known as layering.

In this model, communications functions are divided into a hierarchical set of layers. Each layer performs a related subset of functions required to communicate with another system, and each layer relies on the next lower layer to perform more primitive functions. For the communications system to operate, the same set of layered functions must exist in the two communicating systems.

The peer (corresponding) layers in the two different systems communicate using a set of rules or conventions known as protocols. A protocol is defined by *syntax*, *semantics*, and *timing*. *Syntax* includes data format and signal levels; *semantics* are the control information for coordination and error handling; *timing* includes speed and sequencing. A graphical description of the OSI model is presented in Figure A-1. The dashed lines in that figure represent the layers that must be compatible with each other for successful system operation. The solid line indicates the layers that are physically interconnected with each other.

FIGURE A-1. OPEN SYSTEMS INTERCONNECTION COMMUNICATIONS LAYER STRUCTURE



The OSI model has seven layers:

- *Layer 1 – Physical Layer.* This layer is responsible for the transmission of an unstructured bit stream using a physical link. It defines the mechanical, electrical, and procedural characteristics required to establish, activate, and maintain a link.

- *Layer 2 – Data-Link Layer.* This layer controls the flow of information between devices. It groups bits into frames, controls the data transmission rates, adds the header and trailer (control bits) into frames, and holds the data for transmission until the receiving device is ready to accept it. The Data Link Layer also defines the manner in which errors occurring at the Physical Layer will be detected and corrected.

- *Layer 3 – Network Layer.* This layer defines the manner in which packets of data are transmitted through a network. A message may be made up of more than one packet. The routes followed by the packets may be independent (datagram) or all the packets in a message may follow the same route (virtual circuit). The Network Layer defines the routing, addressing, and congestion control associated with these transmission paths.

- *Layer 4 – Transport Layer.* This layer defines the error-recovery procedures that will be used and provides end-to-end flow control. Flow control is used to ensure that the transmitting device is not sending more data than can be accepted by the receiving device.

- *Layer 5 – Session Layer.* This layer defines the manner in which connections (sessions) between devices are established, managed, and terminated. It also defines checkpoints and restart services in the event that communications are interrupted.

- *Layer 6 – Presentation Layer.* This layer defines the interface between the communications system and the applications programs. The Presentation Layer also defines processing activities that may serve a common requirement of both the communications and applications programs such as encryption, text compression, and reformatting.

- *Layer 7 – Applications Layer.* This layer includes the user software such as data base management programs or accounting software.

It is not necessary to define all seven layers for every communications system. For example, a system that is made up of two processors that are directly connected with each other does not require the definition of the Network Layer. Alternatively, some systems include the use of multiple processors and interfaces to perform the overall communications task. In those cases, different layers must be defined at various points in the communications system.

Figure A-2 demonstrates the use of the OSI model to represent the case of a system that uses front-end processors (FEPs). Figure A-3 is an example of a system that uses an interface controller to access a communications system such as a Local Area Network (LAN). From these examples, one can see that the use of interface equipment such as the FEP or the interface controller can provide the ability to modify the design of the processor (host) containing the applications programs without requiring redesign of the communications system, since design changes in the host processor are accommodated through the modification of the interface device. In some cases, current modernization activities of the Services are making use of FEPs in this manner. The Intelligent Gateway Processor (IGP) that will be used by the Air Force Logistics Command (AFLC) is an example of such a device. FEPs offer a potential capability for rapidly modifying a system in response to changing interface or processing requirements that occur in the defense logistics information communications systems.

FIGURE A-2. OPEN SYSTEMS INTERCONNECTION MODEL FOR FRONT-END PROCESSOR

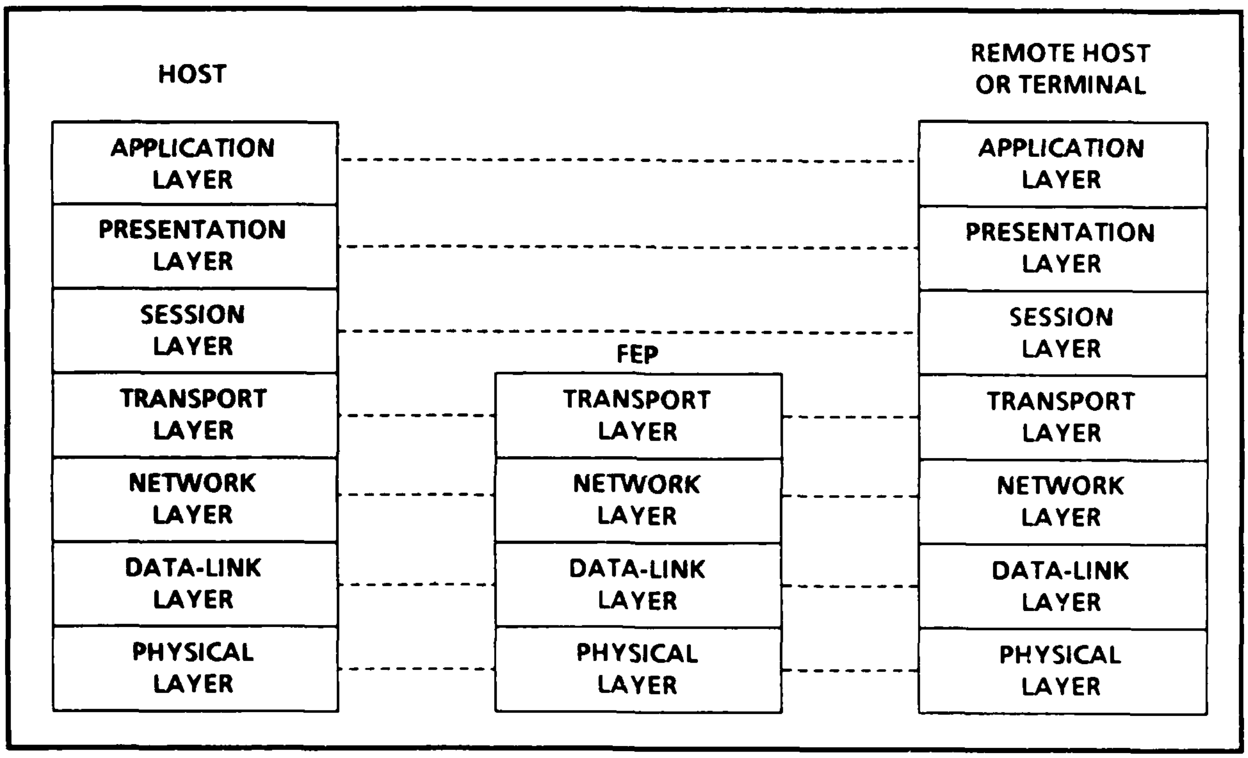
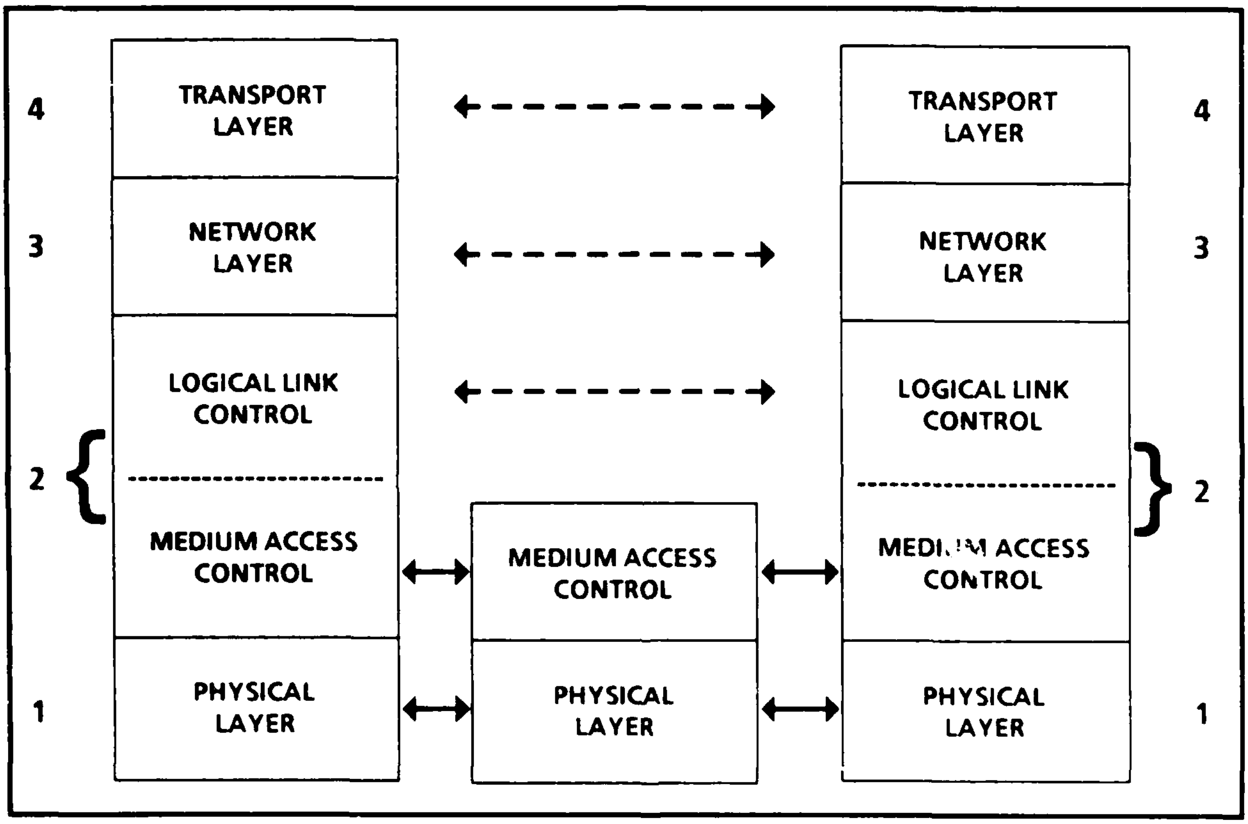


FIGURE A-3. OPEN SYSTEMS INTERCONNECTION LIKE MODEL FOR A LOCAL AREA NETWORK



## APPENDIX B:

## INFORMATION RESOURCES MANAGEMENT PLAN OUTLINE

This outline describes the basic structure of an Information Resources Management (IRM) input document that might be developed for the logistics community encompassed by the Defense Logistics Standard Systems (DLSS) functional requirements shown in Part I, Chapter A, Figure A-1 of this report. This outline generally follows the examples provided in the *Strategic Information Resources Management Planning Handbook* prepared by the General Services Administration (GSA). However, the outline is modified to incorporate additional information planning techniques to accommodate the Department of Defense (DoD) Planning, Programming, and Budgeting System (PPBS). The outline contains sections that cover the Current-Year, Budget-Year, and Five-Year Plan and that do not appear as major headings in the GSA IRM plan outline.

| | | |
|---|---|---|
| 1. | SUMMARY | Contains a Foreword and Executive Summary. |
| 2. | PLANNING ENVIRONMENT | Describes the purpose and scope of IRM planning inputs that can influence logistics information resources planning. |
| 2.1 | INTRODUCTION | Describes the purpose, scope, planning philosophy, and definitions; states the importance of IRM planning in prioritizing projects and supporting budget requests; emphasizes the need for top-down planning and the involvement of top management in the process. |
| 2.2 | CURRENT ENVIRONMENT | Describes the current information systems being used in the logistics community in terms of hardware, applications, and resource requirements. |

| | | |
|---|---|---|
| 2.3 | ENTERPRISE MODEL | Describes the logistics system in terms of specific functions; breaks down, or decomposes major functions into subfunctions; decomposes functions to the level of repetitive processes depending on the level of planning detail desired; presents the functional breakdown in a diagrammatic form to eliminate volumes of text and make it easier to understand relationships between functions; uses the model to develop a joint, common understanding of the functions covered in the IRM input; also serves as a means for dividing the analysis process into logical subdivisions that can be assigned to independent development projects. |
| 2.4 | SUBJECT AREA DATA BASES | Describes in broad terms the subject area data bases (e.g., stock inventory) that are applicable to the functions included in the IRM documentation; maps subject area data bases back to the functional areas they support (e.g., wholesale inventory management). |
| 2.5 | INFORMATION FLOW ANALYSIS | Diagrammatically represents the information required and information produced by the lowest-level functions described in the Enterprise Model (this helps planners define data base structures and decide where data interchanges are required between functions or organizations). |
| 2.6 | TECHNOLOGY ASSESSMENT | Summarizes the technology that will be available over the 5-year planning horizon of the IRM plan; covers such areas as security, hardware, software, data base systems, and communications; evaluates the changes in technology in terms of price and capability; assesses the impact of technological changes. |
| 2.7 | IRM PLANNING FRAMEWORK | Describes the organizational structure for IRM planning and provides schedules and planning check lists. |

| | | |
|---|---|---|
| 2.8 | PERFORMANCE EVALUATION PROCEDURES AND CRITERIA | Describes the criteria by which the performance of projects will be evaluated and specifies the procedures to be used in performing the evaluation. |
| **3.** | **ASSESSMENT OF PRIOR-YEAR PLAN PERFORMANCE** | Provides an evaluation of the prior year's performance measured against the previous Current-Year Plan and describes adjustments that need to be made to the Previous-Year Plan to create a new Current- Year Plan. |
| 3.1 | EVALUATION OF IRM PROCESS | Gives an assessment of the IRM process and how well it performed in terms of project management and resource control. |
| 3.2 | ADJUSTMENTS NEEDED FOR THE CURRENT YEAR | Describes adjustments needed in the prior Budget-Year Plan to convert it to the Current-Year Plan; reviews goals, objectives, project priority, and resource requirements. |
| 3.3 | PLANNING OPTIONS FOR THE BUDGET YEAR | Defines options by possible scenarios described in terms of technological possibilities, likely functional/ organizational requirements, and resource constraints. |
| 3.4 | PRIORITIES FOR THE BUDGET-YEAR PLAN | Describes how resources should be allocated to competing projects; makes the priorities sufficiently specific to allow subordinate organizations to make resource allocations without subjecting the decisions to further study. |
| **4.** | **CURRENT-YEAR IRM PLAN** | Describes the Current-Year Plan for IRM; focuses on linking development projects to resource requirements, functions supported, organizational goals, and project objectives. |
| 4.1 | GOALS AND OBJECTIVES | Describes in broad terms the goals and objectives of development projects underway in the current year. |
| 4.2 | INFORMATION PROJECTS | Summarizes information projects that will be in work during the current year; relates projects to supported functions, objectives, data bases, information systems, interface requirements, and resource requirements. |

| | | |
|---|---|---|
| 4.3 | INFORMATION SYSTEMS | Presents a summary description of information systems that are operating or are in the development phase; provides information on the source of funding and describes hardware, software, data base, and personnel requirements; relates systems to functions, development projects, and interface requirements. |
| **5.** | **BUDGET–YEAR PLAN** | Provides information on the budget year using the same basic topics as the Current-Year Plan. |
| **6.** | **LONG-TERM PLAN** | Provides a Five-Year Plan and an Out-Year Plan for projects that are planned to start after the budget year or for projects that extend beyond the Budget-Year Plan; uses the same topics as the Current-Year Plan and the Budget-Year Plan. |

# APPENDIX C: COMMUNICATIONS TRAFFIC MODEL

## C.1 Introduction.

The data communications processes of the defense supply system are extremely complex. Data communications occur between all of the logistics activities of the Services and Agencies (S/As) using numerous different formats and communications paths.

Communications are defined in terms of standard transaction types defined by the Defense Logistics Standard Systems Office (DLSSO) to permit communications between these diverse sites. More than 500 transaction types have been defined, approximately 150 of which are special transactions used by individual Services. The remaining transactions are used for communications between different organizations.

The most common communications path for a transaction is from the origin to a Defense Automatic Addressing System (DAAS)-site assigned to that origin and from the DAAS-site to the destination. In some cases, communications do flow directly from origin to destination.

The transmission of transactions between logistics sites is a function of the type of site [depot, inventory control point (ICP), transportation, etc.] and the type of transaction. For example, a customer or retail site would typically be the origin of requisitions and the ICP would be their destination, while Material Release Orders (MROs) would flow from an ICP to a depot.

Because of the unique and complex characteristics of defense logistics communications, a data communications model was considered necessary to support the analysis of alternative system architectures and to evaluate the impact of Defense Logistics Standard Systems (DLSS) changes on communications traffic. The unique

characteristics of defense logistics communications precluded the use of existing communications traffic models. While a number of models are commercially available, none offers the capability of identifying different types of traffic and associating them with unique origins and destinations. Such a capability is particularly important for the analysis of the impact of specific DLSS changes on overall communications system traffic.

An additional problem associated with the use of existing models is that their outputs are presented in economic terms. Because of the uncertainty associated with the tariff structure to be applied to the use of the Defense Data Network (DDN), the output of the model must be expressed in terms of general communications characteristics of traffic volumes (either bits of information or packets of information), and the distances between origin and destination of the communicating locations.

For these reasons, a model of the defense logistics communications system was developed. That model is capable of testing different communications network architectural alternatives, transaction configurations, and sets of site characteristics. Its output expresses communications traffic between origins and destinations and the transmission distances of this traffic. It also provides the capability of using different tariff structures to evaluate the impact of these structures on total communications costs. The model outputs also identify the traffic on specific routes between pairs of sites.

The following sections present an overview of the structure and operation of the model.

C.2 Structure of the Model.

Figure C-1 presents the overall flow of data and processing within the model. The model has four sources of input that define the system characteristics: the site characteristics, the transaction characteristics, the switching-node characteristics

(used for the existing system and the first architectural alternative), and the tariff structure.

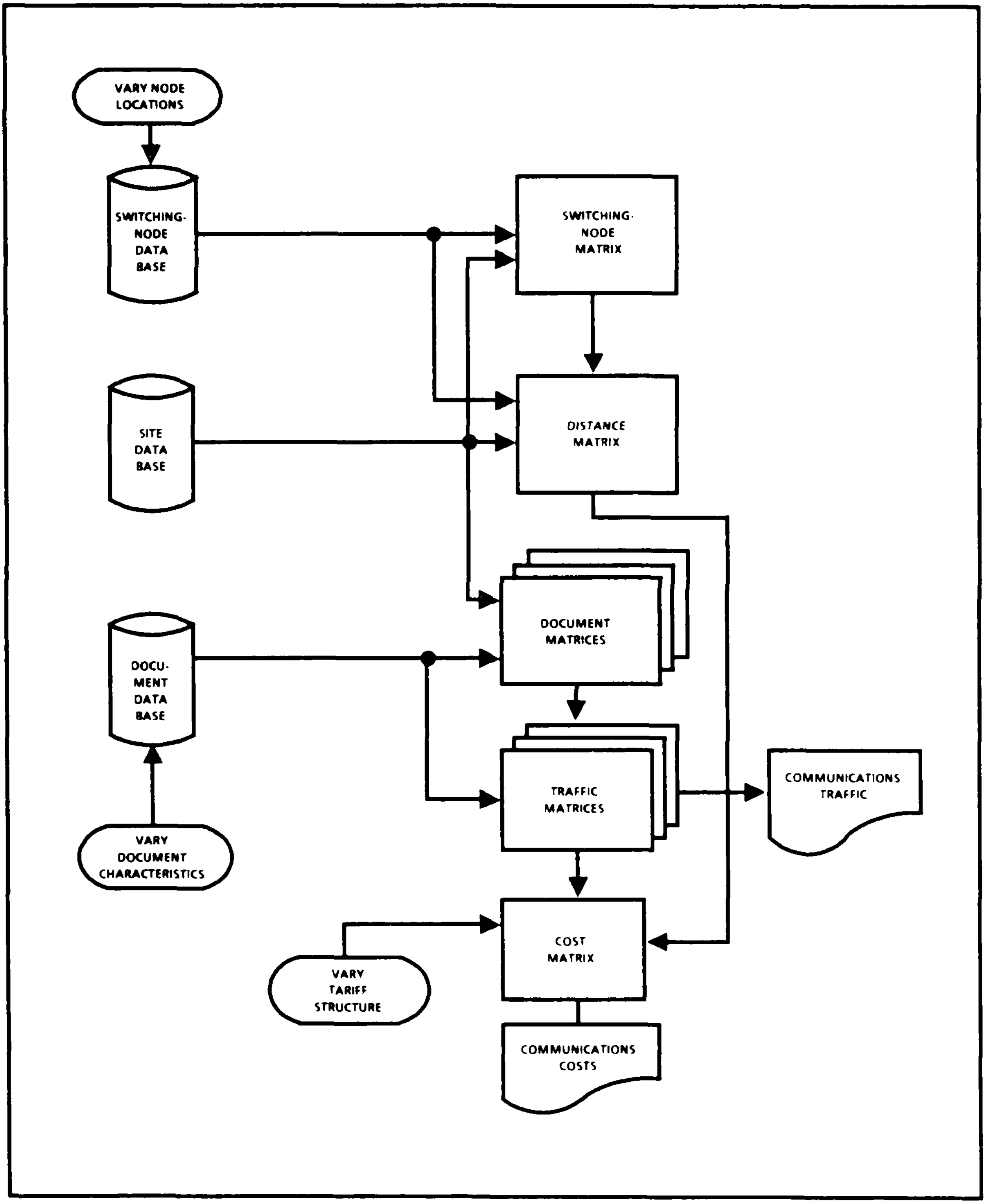
The processing in the model is performed using origin-destination (O-D) matrices to define the distances and traffic between an origin site and its destination. The use of the matrix representation permits calculation of all combinations of origins and destinations between the sites being considered.

The model processes the site and switching-node locations to assign sites to switch nodes. A site is assigned to the closest switching node to minimize communications distances. When this assignment is completed, the distances between all sites are calculated considering the intermediate routing through the switching nodes.

Traffic calculations are performed individually for each transaction type. The processing calculates the O-D traffic matrices for each transaction type by identifying the origins and destinations for each transaction. This identification is performed using the site characteristics and the definitions of possible origin and destination site types from the transaction data base. The traffic for the current transaction type is then assigned to each of the possible sites in proportion to the total traffic at that site. The traffic between origins and destinations is calculated in proportion to the traffic proportions at the destination sites and by using a series of factors that represent the relative proportions of interorganizational traffic that exists in the system. From these calculations, O-D matrices representing the traffic between all combinations of origins and destinations for a single transaction type are generated.

When these calculations have been completed, a final traffic O-D matrix is developed by adding the values in the corresponding cells of each of the transaction matrices. The final traffic matrix and the distance matrices are used to calculate communications costs.

**FIGURE C-1. DEFENSE LOGISTICS COMMUNICATIONS TRAFFIC MODEL STRUCTURE**



The outputs of the model include both the detailed data required for evaluation of traffic and distances between specific origins and destinations and the composite data required for evaluation of system alternatives. The composite data includes total system distances, total traffic, and total communications costs. These two outputs – the detailed data and the composite data – permit the use of the model for comparison of alternatives and for the detailed system analysis required to estimate system elements such as communications capacities, switching-node characteristics, and gateway processor (GP) capabilities.

C.3 User Input Data.

The input data used to define the system architecture and traffic flow characteristics for the model include:

- Site Characteristics – All major sites of the current logistics system are included in this data base. The characteristics used to define each site include its name, state, type of site (customer, retail, ICP, depot, etc.), organization [Military Service, Defense Logistics Agency (DLA), General Services Administration (GSA), Coast Guard, or other civilian agency], its latitude and longitude, and time zone. The total existing communications traffic entering and leaving this site, based on Logistics Information Data Service (LIDS) data, are also included in this data base.

  The latitude and longitude are used for calculating communications distances; the time zones are used for the calculation of peak traffic conditions; and the DAAS sites are included in the site characteristics data base to account for the traffic that they originate, such as response to source of supply inquiries.

  A total of 91 logistics sites are included in this data base. These sites account for 85 percent of the total logistics communications traffic.

- Switching-Node Characteristics – The switching nodes are the sites through which all communications traffic is routed. They are required for two of the architectural alternatives, the existing system and Alternative 1 as described in Part III, Chapter A. The two DAAS sites are treated as switching nodes for both of these alternatives. The data included in the switching-node data base include the site name, state, latitude and longitude. The latitude and longitude are used for the calculation of communications distances and for the assignment of destination sites to specific switching nodes.

- Transaction Characteristics – The characteristics of each of the more than 500 transactions are defined in this data base. These characteristics include the three-character alphanumeric transaction identifier, the transaction length in bytes (most transactions in the existing system are 80 bytes long), the allowable origins and destinations for the transaction, and a growth factor to account for variations in transaction usage (such as future on-line inquiries) or modifications to transaction format. This data base also includes the total traffic for this transaction type.

These three data bases are stored as separate files that can be modified by the user. Differing architectural alternatives can be tested by changing the number of switching nodes and their locations. The effect of modifications to transaction formats can be evaluated by changing transaction length and total transaction volumes.

Tariff structure can also be incorporated in the model as a user input. The tariff structure can be defined in terms of:

- Cost as a function of communications distance – This variable is characteristic of the rate structure for voice communications such as the American Telephone and Telegraph (AT&T) long distance message toll service.
- Cost as a function of the total number of communications ports at all sites – This cost is incurred as a monthly charge that is related to the capacity of the port, the number of ports, and the equipment required at each port. It also includes the cost of access lines between the local site and the data communications service. The number of ports required is automatically calculated by the model.
- Cost as a function of communications traffic – This cost is calculated as a function of the number of kilopackets of data transmitted between sites. When switching nodes are included, the data communications traffic is doubled to account for the fact that all data are communicated twice.

The variables that make up the tariff structure are applied to the final estimates of traffic and communications distance produced by the model.

C.4 <u>Processing Techniques</u>.

As previously indicated, all data in the model are represented as a series of matrices defining the communications characteristics between the origin and destination. An additional set of matrices has also been developed to reduce the number

**TABLE C-1. DEFENSE LOGISTICS COMMUNICATIONS TRAFFIC MODEL TRANSACTION CONSOLIDATION MATRIX**

**(Values Shown are Monthly Document Volumes in 1,000's)**

| DOC ID | (FROM) CUSTOMER (TO) ICP | CONSOLIDATED TRANSACTION TYPE | | | | | TRANSACTION TOTAL |
|---|---|---|---|---|---|---|---|
| | | ICP to Customer | Depot to ICP | ICP to Depot | Depot to Transport | | |
| A01 | 251 | 0 | 0 | 0 | 0 | • • • | 755 |
| A02 | 6 | 0 | 0 | 0 | 0 | • • • | 17 |
| A04 | 4 | 0 | 0 | 0 | 0 | • • • | 13 |
| A05 | 0 | 0 | 0 | 0 | 0 | • • • | 0 |
| ⋮ | | | | | | • • • | 0 |
| A21 | 0 | 6 | 0 | 0 | 0 | • • • | 20 |
| A22 | 0 | 0 | 0 | 0 | 0 | • • • | 0 |
| ⋮ | | | | | | • • • | |
| TOTALS FOR CONSOLIDATED TRANSACTIONS | 1,076 | 4,225 | 1,650 | 1,380 | 28 | • • • | TOTAL |

of transaction types that must be processed by the model. The rows of the transaction consolidation matrices, shown in Table C-1, define the existing transactions by transaction identifier, and the columns identify the types of sites that can serve as origins and destinations for these transactions. For example, a requisition that might be transmitted from a customer to an ICP and from a retail site to an ICP would be identified by entries in the cells represented by the appropriate site origins and destinations. All transactions with the same origins and destinations are combined into a single transaction type for processing by the traffic model. All transactions sharing a common origin and destination are combined and processed as though they were a single transaction type. Thus, it is only necessary to process 29 combined transactions instead of the 500 individual transaction types. The

common characteristic of combined transaction types is that all of the transactions included have common origins and destinations.

The remaining processing within the communications model is performed using the O-D traffic matrices shown in Table C-2. Those matrices are used to support each of the processing steps. For example, processing of distances between origin and destination is performed using the following steps:

- Direct communications distances between origin and destination (used for Alternative 2 described in Part III, Chapter A) are calculated as the square root of the sum of the squares of the north-south and east-west distances between origin and destination. The north-south and east-west distances are calculated using the latitudes and longitudes of the sites. This calculation is performed for every origin and destination.

- For the alternatives that include switching nodes, distances are calculated based upon the distance between every site and every switching node. The shortest distance is then selected and used to represent the distance from origin site to switching node.

**TABLE C-2. TYPICAL DEFENSE COMMUNICATIONS TRAFFIC MODEL ORIGIN-DESTINATION TRAFFIC MATRIX**

(Shows typical document traffic in 1,000's of documents for a single document type)

| ORIGIN SITE NUMBER | DESTINATION SITE NUMBER | | | | | | TOTAL ORIGIN TRAFFIC |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | ••• | |
| 1 | 0. | 1,214. | 62. | 158. | 12. | ••• | 467 |
| 2 | 46. | 0. | 400. | 360. | 100. | ••• | 2,678 |
| 3 | 83. | 219. | 0. | 51. | 408. | ••• | 910 |
| 4 | 126. | 46. | 8 | 0. | 20. | ••• | 260 |
| 5 | 62. | 60. | 12. | 0. | 0 | ••• | 173 |
| ⋮ | | | | | | ••• | ⋮ |
| TOTAL DESTINATION TRAFFIC | 316 | 2,005. | 719. | 892. | 1,294. | ••• | 5,328 |

- The distance between the switching node (selected for the origin) and the destination is then added to the shortest distance calculated in the previous step to determine the total communications distance from origin to destination. This distance is stored in the appropriate cell of the distance O-D matrix.

The traffic matrices are developed using the organization and type of site defined by the site data base, and the traffic volumes and site types of the transaction data base. The processing steps performed for the calculation of the traffic matrices include:

- Calculation of the originating traffic from every site for the transaction type. This calculation is performed only for those sites whose site types match the origin-site type of the transaction being processed. Traffic is calculated as the product of the percent of traffic produced by the transaction, times the actual traffic originating from the site.

- Calculation of the destination traffic at every site for the transaction type. This calculation is performed only for those sites whose site types match the destination-site type of the transaction being processed. Traffic is calculated as the product of the percent traffic produced by the transaction, times the actual traffic originating from the site.

- A total traffic matrix identifying transactions flowing from an origin to a destination is then calculated by proportioning the origin traffic to the destination traffic, as a function of relative percent of traffic arriving at that destination. An additional factor is incorporated reflecting the distortion of traffic patterns by the fact that traffic flows either between DLA and another organization or within a given organization. For example, the majority of traffic originating at an Army site is transmitted either to another Army site or DLA. An insignificant amount of Army traffic would be transmitted to the Navy or Air Force.

- The final step of this process is the calculation of a composite traffic matrix through the cell-by-cell addition of the individual traffic matrices.

The communications system cost is calculated using the distance and traffic matrices using the following procedures:

- The number of kilopackets of information transmitted from each location is calculated as the total number of transactions transmitted, times the average transaction length in bytes, times the number of bits per byte. This value is used to calculate the usage charge and the number of ports at each site.

- The number of ports is calculated as the number of kilopackets of information, times the bits per kilopacket, times the peak hour factor, divided by the data rate of the port.
- If a fractional number of ports is calculated, the value is rounded up to the next highest value.

The usage values and the number of ports are then multiplied by the user-supplied tariffs to estimate the cost of the service.

C.5 Applications.

This communications model has been developed to serve as a tool for evaluating the costs and capabilities of the defense logistics communications network system. Costs produced by the model will be used to evaluate the communications cost associated with the implementation of each of the three communications network architectures described in Part III. These costs will be developed using the comparable cost of commercial packet-switched data communications services.

The model will also be used to develop the refined costs of processing equipment required to perform gateway and routing functions for logistics data. The model will support this analysis by providing estimates of traffic loading at each site served by a communications processor.

The model can be used to evaluate the impact of changes in DLSS data standards on communications traffic. This evaluation is important for evaluation of on-line traffic, transmission of transportation transactions, and transmission of graphics data, all of which can lead to significant increases in traffic loads.

The model can be used to support the logistics community's evaluation of the impact of tariff structures proposed by the Defense Communications Agency (DCA) for DDN. A number of different approaches could be used by DCA to define this structure. It is important to evaluate those costs before tariffs are finally established.

In addition to these applications, the model can be used to evaluate the impact of changes in logistics system operation on communications requirements. These changes might include communications loads during transition from peacetime to wartime logistics operations or a change in the role of a major supply system installation.

Thus, this communications model is capable of serving as a tool to be used in the support of planning activities associated with a changing logistics environment.

# APPENDIX D: DATA BASE MANAGEMENT

A large number of data base management systems (DBMSs) are in the marketplace and, accelerated by the microcomputer boom; that number is increasing rapidly. Today, without international, national, or Federal standards, virtually every commercial data base product is unique. It is, therefore, appropriate for the Defense Logistics Standard Systems (DLSS) to consider defining standards for DBMSs used in logistics applications. The past few years have been productive for DBMS standardization. Surveys of DBMS-related standardization activities can be found in "DBMS Standardization – 1979 to 1983," *Computers and Standards, Vol. 2*, No. 2, 1983, pp. 119 – 126, by T. W. Olle. Such widespread activity is essential for a successful DBMS standardization effort.

This appendix discusses DBMS-related standardization efforts underway. The American National Standards Institute (ANSI) proposals for data base standards are under critical review by a special international data base experts group that will make recommendations to its parent International Standards Organization (ISO) Committee. Federal and Department of Defense (DoD) representatives are active participants on ANSI data base committees. It is likely that international and Federal standards will derive from, and be consistent with, resulting ANSI standards. It is vital in the evolving logistics systems environment that DoD also recognize, accept, and publish through the DLSS, the developing ANSI DBMS standards.

This appendix also presents an introduction to data base machines (DBMs). The types of DBMs currently available on the market are categorized according to the functions they perform and their relation to the host computer.

The final section of this appendix discusses prototype efforts underway within the DoD for interfacing heterogeneous distributed data base management systems (DDBMSs). This discussion supplements information provided in Part III, Chapter C.

D.1 <u>DBMS Standardization Efforts</u>.

This section addresses activities related to DBMS standardization including:

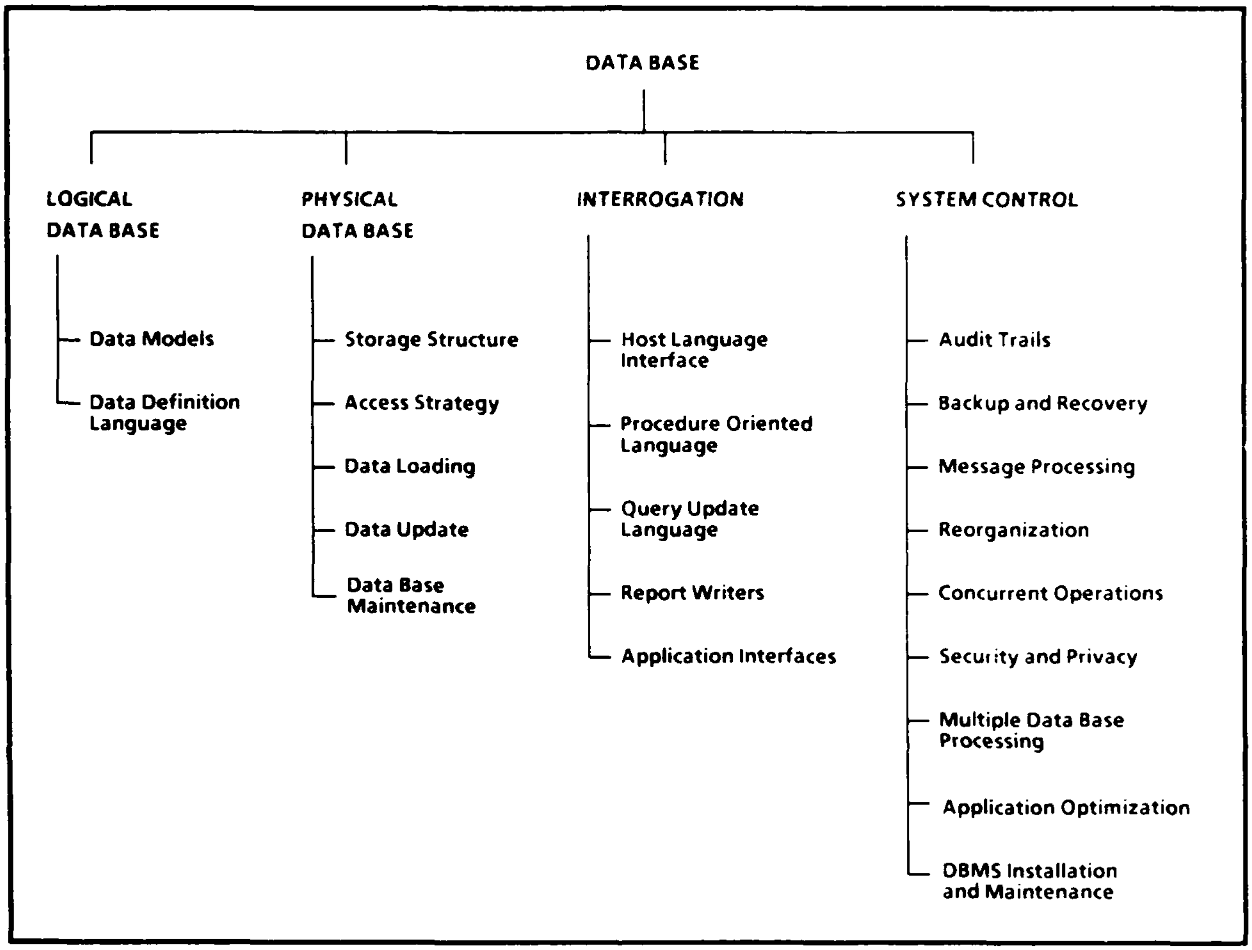
- Reference Model – provides a conceptual framework for the study and organization of DBMS standards activities.
- Data Model – provides a means for classifying and understanding implementations of DBMSs. Some DBMSs may support multiple data models.
- Data Base Language – specifies the syntax and semantics of data base languages (e.g., schema definition language and data manipulation language). The standards for Structured Query Language (SQL) and Network Database Language (NDL) are presented here.
- Data Base Interchange Forms – facilitates data base translation. The National Bureau of Standards (NBS) proposal for a method for representing the data structures of the newly proposed network and relational data models is discussed.

Figure D-1 presents a breakdown of DBMS components. The ANSI/NDL and ANSI/SQL standards are addressing data models and data definition languages as part of logical data base standards efforts. ANSI standardization efforts are also addressing host language interfaces under data base interrogation. Other components listed in Figure D-1 are being addressed by other standardization activities.

D.1.a <u>Reference Model for DBMS Standardization</u>.

The NBS has proposed a Reference Model (RM) for DBMS standardization. An RM is a conceptual framework to divide standardization work into manageable pieces and to show, at a general level, how those pieces are related to each other. A well-known example of an RM is the ISO RM of the Open Systems Interconnection (OSI) layered architecture discussed in Appendix A, a major tool for standards activities relating to interprocess communications.

FIGURE D-1. DATA BASE MANAGEMENT SYSTEM COMPONENTS




*Source:* Whitemarsh Data Base Taxonomy

The OSI and DBMS RMs should complement each other as parts of a more complete model for computer-based information systems. Distributed data bases require a system interconnection framework such as that provided by the OSI model. DDBMSs require additional services beyond those needed to support centralized data base management. DDBMSs can be characterized by the types of data they support and the types of distribution. Both heterogeneous and homogeneous DDBMSs are addressed by the RM.

Some of the objectives of a DBMS RM are:

- To serve as a tool for the development and coordination of standards in the DBMS area. An RM identifies important interfaces that can then be standardized by appropriate technical committees.

- To describe interactions between the DBMS and other software components in an information system, such as data dictionary systems, report writers, etc. This, in turn, might influence DBMS vendors to provide plug-compatible components.

- To facilitate the training of personnel by providing a common framework for describing DBMSs.

- To allow classification of vendor implementations.

- To aid users in reviewing, changing, and introducing DBMSs into an organization.

Although the RM itself is not a proposal for a standard, it provides a basis for considering future standards efforts. Important benefits may be achieved from DBMS standardization by users, purchasers, computer service management and staff, vendors, and DBMS designers. Potential benefits that can be gained from the standardization of the DBMS are:

- Mobility of applications and portability among hardware. If DBMS standards are adopted by manufacturers and vendors, users will be able to develop applications for use on different computers.

- Improved staff productivity and reduced training costs. The costs involved in staff education are high. If DBMS standardization is achieved, costs associated with reeducation of DBMS users and programmers and the temporary loss of productivity linked with staff turnover will be reduced.

- Simplification of DBMS selection and evaluation. At present, the DBMS selection and evaluation process is both complex and expensive and, consequently, is often conducted only superficially. Adoption of a limited number of standards will make the evaluation process simpler.

- Reduced costs. The adherence to standards by vendors will lower the cost of the product in the community.

- Increased feasibility of data interchange between DBMSs. The need for data generated from one DBMS to be loaded into another DBMS is growing. The introduction of DBMS standards will make data interchange more feasible.

The primary audience for the RM consists of the ISO and ANSI experts involved in DBMS standardization. The proposed RM is based on the first ANSI/ Standards Planning and Requirements Committee DBMS framework. This framework describes a DBMS in terms of a three-schema architecture: external schema (user view), conceptual schema (logical data base design), and internal schema (physical implementation).

D.1.b Data Models in the Selection and Use of DBMSs.

Potential users need a method for differentiating among the large number of DBMS products according to their fundamental capabilities without becoming overwhelmed by highly specialized features of specific implementations. The concept of a data model provides such a means for classifying and understanding implementations of DBMSs. Fortunately, many DBMS products are based on a small number of data models that have received extensive attention in the research literature.

A data model is a collection of data structures together with a collection of operations that manipulate the data structures to store, query, or process the structure contents. A data model may also include the integrity constraints defined over the data structures, or it may include access control facilities or mechanisms for defining various external user views of the data base. Some data models provide physical storage structures and physical access methods as part of the data model, but a data model is usually limited to the data structures and operations that are available to an end-user and may be accessed from an application program.

A DBMS supports a data model and is an implementation of it. Some DBMSs may support multiple data models by providing different user interfaces to the data base. A DBMS provides for transformation of the logical data structures of a data model to the physical storage structures of a particular hardware environment.

ANSI Committee X3H2 is currently working on specifications for two models that are similar but not identical to many existing products. The network model is a

structure-oriented model especially suitable for data bases with static structures and a high volume of record-at-a-time processing. The relational model depends more heavily on operations than structures and, thus provides the flexibility to handle dynamic data bases. Examples written in the draft NDL and the Relational Database Language (RDL) demonstrate that both models can answer complex queries in a straightforward manner.

An important feature of planned data base standards is that no single interface specification will exclude other interfaces between the end-user and the data base. For example, both the NDL and RDL assume a programming language interface to the data and yet they acknowledge the existence of other user interfaces such as ad hoc query and report writer languages, schema manipulation languages or data dictionary interfaces, special transaction-processing systems that take advantage of modern screen and graphics capabilities, and bulk loading or unloading facilities both for data base back-up and for data base information interchange. Language specifications for these additional capabilities are, at present, unique to each DBMS vendor. If and when standard specifications become available, they should be upwardly compatible with established data model standards.

While there are far more data models than the two currently in the process of standardization, most others are either structure-oriented like the network model or operation-oriented like the relational model. Particular vendors have, in many cases, developed tools or features that compensate for some of the limitations inherent in the data model underlying their products. The still difficult job is to match the features of a proposed DBMS with the particular application requirements of the users.

D.1.c Data Base Language Standards.

This section discusses two data base language standards proposed by ANSI Committee X3H2, the SQL and the NDL standards.

The SQL standard specifies the syntax and semantics of interfaces to DBMSs for defining and accessing SQL data bases. Two data base languages are specified:

- A schema data definition language [DDL (SQL-DDL)], for declaring the structures and integrity constraints of an SQL data base
- A module language and a data manipulation language [DML (SQL-DML)], for declaring the data base procedures and executable statements of a specific data base application.

The SQL standard specifies functional capabilities for designing, accessing, maintaining, controlling, and protecting the data base. It also provides a vehicle for portability of data base definition and application modules between conforming systems.

The SQL standard applies to implementations that exist in an environment that may include application programming languages, end-user query languages, report generator systems, data dictionary systems, program library systems, and distributed communication systems as well as various tools for data base design, data administration, and performance optimization.

The NDL standard specifies the syntax and semantics of three data base languages:

- A schema definition language for declaring the structures and integrity constraints of an NDL data base
- A subschema definition language for declaring a user view of that data base
- A module language including DML for declaring the data base procedures and executable statements of a specific data base application.

The NDL standard specification constitutes a definition of the logical data structures and basic operations for an NDL data base. It provides functional capabilities for designing, accessing, maintaining, controlling, and protecting the data base.

D.1.d DBMS and Data Base Portability – Approaches to Data Base Translation.

Transporting a data base from a source to a target environment has often been an expensive and complex project. In large part this expense and complexity are due to the lack of standards for data models and data base interchange forms. An NBS report[1] describes approaches to data base translation, discusses candidate interchange forms, and recommends a method for representing the data structures of newly proposed network and relational data models in a form suitable for data base interchange. Methods for representing other commonly used data base structures in terms of the proposed standard structures show that automated data base translation is feasible for most currently installed data models.

The entire process of transporting an application system from one environment to another while maintaining the functional requirements of the original system is termed conversion. The conversion process consists of a number of different phases, including planning, data preparation, and testing; however, the essence of conversion is the translation phase in which the actual source-to-target transfer occurs. When a DBMS is involved, the conversion process is complicated, primarily because the DBMS imposes a structure on the data and on data manipulation. The situation is further complicated because no standard DBMSs exist and consequently few general conversion tools are available. Each conversion to or from a DBMS tends to be a unique situation.

The required resources and accrued costs associated with data base translation are closely related to the dissimilarities of the data models of the source-and-target environments, the availability of automated translation aids, and the experience of

[1] L. Gallagher and S. Salager, *Report on Approaches to Database Translation*, NBS SP 500-15, May 1984

the conversion personnel. The following situations are prime factors affecting the costs of data base translation:

- No general-purpose data base translation aids (e.g., documented software packages or "turnkey" products) that have effective applicability to multiple translation environments are currently available. Each organization is required to design, develop, test, and document the aids needed for a particular conversion.

- Translation aids that do exist are usually tailored to very specific source-and-target combinations.

- The lack of translation aids forces many data base conversions to depend on specially developed, one-time aids constructed in-house or under contract.

- Translation experience among agency personnel is often acquired through "live-and-learn," on-the-job conversion projects. In-house learning experiences are often expensive especially since data base translation can be very complex.

- Translation frequently requires detailed expertise with the data handling conventions of two systems – the source system and the target system. In most data-processing shops, the degree of competence is high for any given system but diminishes as the scope extends beyond that one system.

- DBMS and data base translation standards are not available. There is no standard DBMS that may be incorporated to circumvent the costs and complexities associated with data base translation. Also, there are no standard "unload" and "load" methodologies adhered to by the various data base management packages on today's market.

The focus here is restricted to one area of the translation phase of conversion in a data base environment, namely data base translation. The NBS report deals with transferring data and data definitions from a source, which can be either a batch file system or a DBMS, to a target DBMS. It does not consider application program translation, discussed in the next section, which deals with expressing and converting operations on the data. Although not explicitly addressed here, a general purpose data base translation approach may be useful in a distributed data base environment involving heterogeneous DBMSs.

An example of user and vendor interest in a generalized approach to data exchange is the Initial Graphics Exchange Specification (IGES). IGES is a

communication file structure for data produced on and used by computer-aided design (CAD) and computer-aided manufacturing (CAM) systems. This structure provides a common basis for the automatic interchange of data between interactive graphics design-drafting systems, for the transfer of data to and from external application programs, and for archiving the data. The IGES project is an organized effort of both Government and industry, on a national level, to resolve interface problems by introducing a set of specifications for standard data structures and formats. That users and vendors alike recognize the value of this response to the data exchange problem is demonstrated by the rapid acceptance of IGES as an American National Standard.

In a similar manner, standardization of data models of an interchange form (ICF) and of intermodel mappings would alleviate some of the difficulties involved in developing general-purpose software for data base translation. Standardization of an ICF would facilitate specification of intermodel mappings, because the mappings could be defined in terms of the ICF structures. Standardization of an ICF implies standardization of data models because ICF structures are to be defined along with rules for their correspondence with data structures of specific data models. Proposals for a network model and a relational model currently under consideration by ANSI Committee X3H2 are discussed above.

Several candidates to serve as the common ICF include:

- The Structured Data Interchange Form proposed by James P. Fry and Associates at the University of Michigan
- The Data Descriptive File (DDF) advanced by ANSI Technical Committee X3L5 and ISO TC97/SC15
- The Data Extraction, Processing, and Restructuring System (EXPRESS) designed by Robert W. Taylor and researchers at International Business Machines Corporation (IBM) Research Laboratory
- The Data Interchange Form used by several personal computer software vendors

- The specification for the Data Interchange at the Application Level (DIAL) under development within the British Standards Institution
- The Standard Format Data Unit project under development by the National Aeronautics and Space Administration (NASA) and other national space agencies.

NBS concluded that each candidate ICF is incomplete and cannot be used for general data base translation without additional specification. Each of these candidates has characteristics that make it potentially suitable as a data base ICF although some are much more general or flexible than others. Some forms require specific implementation details to describe how the data structures are laid out in linear form; others require additional specifications for mapping specific data base data structures to the candidate ICF.

Use of the DDF form is favored because it is already near acceptance as an ANSI and ISO standard. Much development time and effort can be saved by using this existing and familiar form whenever possible. Use of the DDF, together with the data base representation rules specified in the NBS report, provides a complete specification for representing proposed standard data base structures in a linear form that can be transported among heterogeneous data base installations. Acceptance of a general data base ICF will ensure more rapid development of additional conversion tools, such as vendor-supplied functions for loading and unloading data bases into standard formats and sophisticated model-to-model mapping capabilities. If users anticipate future conversions when selecting systems, they can require vendors to provide data structures compatible with standard data models and automatic tools for convenient production and transmission of those structures via standard ICFs.

The DDF ICF was never intended to be a highly efficient representation for use in real-time data interchange. Acceptance of the DDF as one vehicle for data base translation, especially for archival purposes or for occasional data exchange, should

not stifle development of other forms that may be more suitable or offer greater efficiency for specific applications or in special environments. In particular, work on standard forms for data interchange in OSI will continue within Federal, ANSI, and ISO standardization committees.

Acceptance of standard data models and general data base ICFs could produce substantial benefits to DBMS users in terms of cost savings and increased flexibility. Subsequent vendor-supplied, automated tools for reading and writing data base structures into standard forms for interchange would make data sharing among nonhomogeneous installations a convenient and inexpensive operation.

D.1.e The Navy Inventory Control Point (ICP) Portability Study.

In addition to issues pertaining to data base translation, several studies are underway in DoD to address the portability of DBMSs and application programs. The Navy ICP approach is discussed here. Problems in this approach are experienced in three areas: the data model of the DBMS that is used to manage the data base, hidden semantic differences, and the magnitude of requirements of applications in a real operating environment.

If the data model of the target DBMS is different than the data model of the existing DBMS, significant problems may arise. The most serious problem is the fundamental difference in the way different DBMS models manage relationships between records of the same and different types.

The goal of the Naval Supply Systems Command (NAVSUP) since it acquired its current hardware is to define how to achieve its best use. DBMSs are a critical component of the NAVSUP effort. Over the years, only one of the four popular DBMS data models has been widely used on different computer hardware (IBM, UNIVAC, Honeywell, etc.). This DBMS data model concept is called CODASYL (Conference on Data Systems Language).

A NAVSUP study examined a representative sampling of DBMSs that subscribe to the CODASYL data model concept to determine the most portable subset of facilities within this concept. Table D-1 presents the relative levels of effort for converting from various CODASYL-based DBMSs to a different CODASYL-based DBMS.

**TABLE D-1. RELATIVE LEVELS OF EFFORT FOR DATA-BASE APPLICATION CONVERSION**

| DBMS CONVERTED FROM: | DBMS CONVERTED TO: | | | | | | |
|---|---|---|---|---|---|---|---|
| | Network | | Hierarchical | | IND LOG File | | Relational |
| | Total | IDMS-static | IMS | S2K | ADABAS | FOCUS | IDMS-dynamic |
| TOTAL | N/A | 3 | 4 | 4 | 4 | 4 | 5 |
| IDMS-static | 3 | N/A | 4 | 4 | 4 | 4 | 5 |
| IMS | 4 | 3 | N/A | 3 | 4 | 4 | 5 |
| S2K | 4 | 3 | 3 | N/A | 4 | 4 | 3 |
| ADABAS | 4 | 4 | 4 | 4 | N/A | 3 | 3 |
| FOCUS | 4 | 4 | 4 | 4 | 3 | N/A | 4 |
| IDMS-dynamic | 4 | 3 | 4 | 4 | 3 | 3 | N/A |

[1] No change.
[2] Only syntax changes
[3] New syntax and significant semantics changes
[4] Both data base and application modification
[5] Complete application redesign and implementation.

In addition, since the Navy acquired the DBMS, a subscriber to this CODASYL data model concept, the Navy study recommends a specific subset of the IDMS/ Relational facilities that should be utilized to maximize portability while at the same time enabling fully functional data base applications. The recommended subset, therefore, includes facilities which, while not portable, are required for complete DBMS functionality.

Since the NAVSUP study concentrated on issues surrounding porting data bases of DBMSs that all subscribed to the same data model concepts (CODASYL), the portability analysis was able to concentrate on detailed issues of syntax and semantics. Most features that were portable are contained in the ANSI/NDL specification, which covers the syntax and semantics of the schema including record types, data elements, and relationships that relate record types.

We make four recommendations. First and most important, data base applications should be as DBMS- and computer-independent as possible to maximize future portability. That is, they should be designed to mirror the natural business needs of the organization that they serve and be designed using top-down, policy-based, data base project methodology. Applications will be in their simplest form, and will be more portable than if they had been designed always to achieve the maximum performance capabilities of the DBMS or the computer.

Second, the Navy and the U.S. Government should pursue the standardization of the ANSI/NDL and the ANSI/SQL data models so that future conversions will be able to cite standards rather than concepts.

Third, the Navy should procure only DBMSs that are as close as possible to the ANSI/NDL and the ANSI/SQL data models since those data models represent the only network and relational data model standards that have been developed with the support of all the major hardware vendors – with standardization in mind.

Fourth, the Navy should advocate the development of an ANSI/4GL (Fourth-Generation Language), that accesses both the ANSI/NDL and the ANSI/SQL. Since some vendors have already developed a common 4GL to access their relational and network products, and since some of the CULLINET 4GL languages access both the network and relational facilities, the concept is certainly proven. Most increases in programmer productivity for the foreseeable future will be through these types of languages, and since the number of automated systems will increase, it follows that

to have an ANSI/4GL would make future NAVSUP application development efforts both more productive and more portable. Without an ANSI/4GL standard, major development efforts will have to remain in Common Business Oriented Language (COBOL), with the use of 4GL restricted.

## D.2 An Introduction to Data Base Structure and Data Base Machines.

The development of DBMSs has been governed by five management objectives:

- To maximize data independence, or to provide the ability to separate data from programs that access and manipulate the data to provide flexibility – Data independence, in its highest form, allows a user to change data, add or delete categories, and reshape the data base, without rewriting data management programs.

- To ensure integrity and consistent quality of data in the system – In a high-speed system with frequent data updates and many users, this task can be very complex.

- To maintain intrasystem security – This issue becomes increasingly sensitive when a single computer is shared by many agencies and their respective personnel. When users of remote terminals can dial-up and access data, ensuring data security is essential.

- Support multiple-user access to integrated data – A system must be structured so that authorized new users have access to data manipulation facilities needed to perform their jobs, while reducing the risk of excessively redundant data files and data manipulation that is highly consumptive of computer resources.

- Central control of the data base – Authorized personnel must be able to control the quality and integrity of a data base.

These five objectives of data management frequently produce conflicts that must be resolved or balanced. Many possible combinations of hardware and software have been devised to achieve these objectives. DBMSs can be compared by four basic criteria: (1) response time to queries/updates, (2) size of data base that can be supported, (3) flexibility for handling varying data types, and (4) other features that can affect performance (for example, security controls, which can slow down a system).

In a few rare cases an application is so well defined and insulated from other applications that the data base will not change. In practice, however, most of the time an initial appearance of stability proves to be deceptive. Some DBMSs are designed around these criteria. Others are not designed to facilitate change and do not provide for the processing of data in a manner other than that in which they are organized. These latter systems do not permit data to be restructured without consequent upheavals in the programs that use them.

Hierarchical or network DBMSs can be fast, but a user is often expected to know exactly where the desired information is stored in the system. Hierarchical and network systems perform well on static data bases with relatively predictable queries and are suitable for many archival or static applications. However, such DBMSs have not kept pace with end-user demands for new applications. They require considerable time to program. Programmers must understand the environment, the data and their uses, and exactly how to structure the data before they can write the computer program code. They typically require reprogramming when data or user needs change or when the host computer changes.

Unlike traditional data base models, the relational data base model accommodates all data in tables; the programmer or user need not memorize complex pointer schema or links to navigate through the data bases. The relational approach also creates data independence, meaning that the programs that control physical storage, allocation, and data management do not depend on the amount or kind of data in the data base. Data independence from programs, in turn, allows the user to change types of data in data bases or to add data to data bases without needing to rewrite data base management software. This is a flexible, expandable DBMS that nonprogrammers (as well as computer specialists) can easily and efficiently use.

While relational DBMSs have advantages over conventional systems, they still face liabilities when measured against the objectives of DBMSs and the criteria for

comparing them. The relational DBMS is a heavy user of computing resources, particularly for large data bases. A typical mainframe-based application will require 4 to 16 megabytes of main memory and several gigabytes of secondary (disk) storage. Moreover, the DBMS is likely to dominate the central processing unit (CPU) during periods of heavy demand, as it translates user queries into data access commands, searches the secondary storage for the records that satisfy user requirements, and frames a reply to the user's terminal or printer.

D.2.a Back-End Processing.

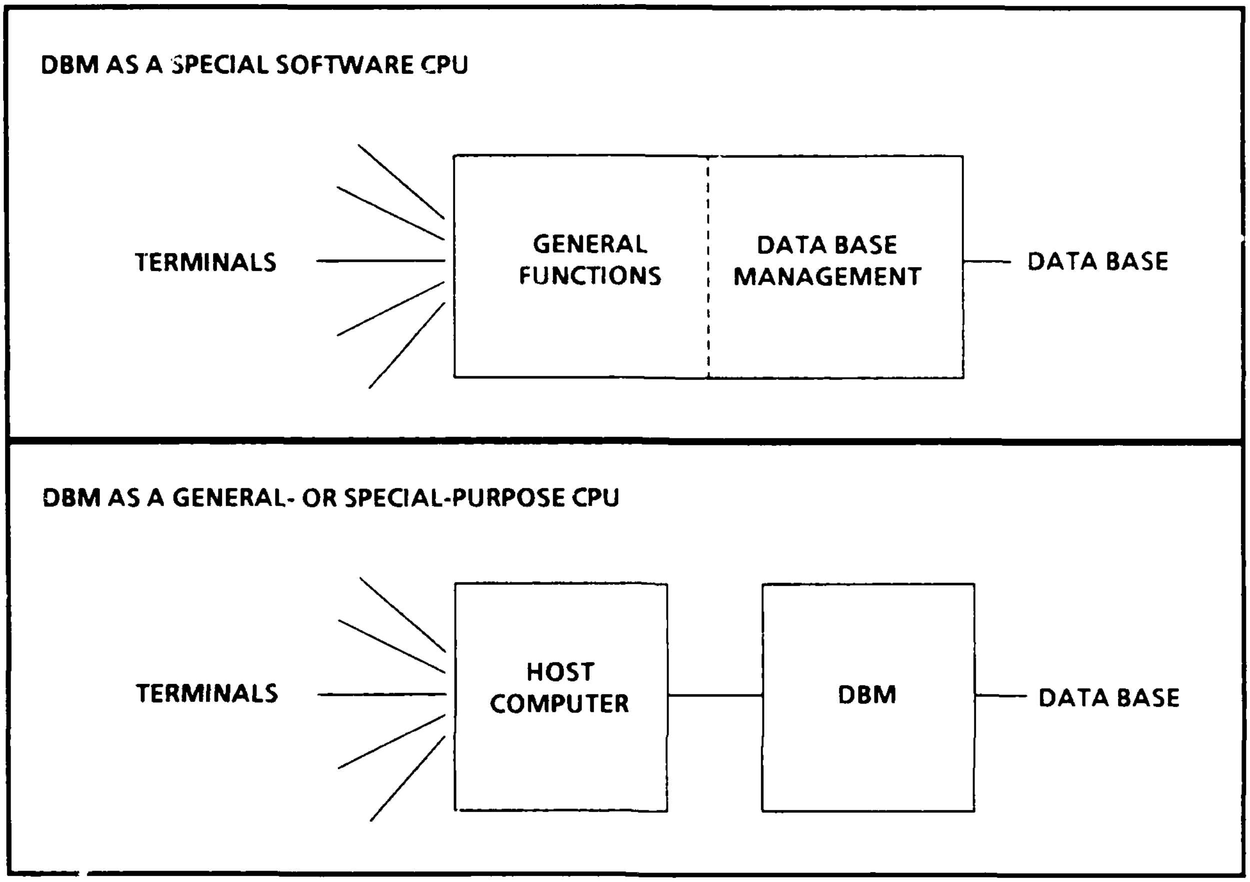
Designers have faced these liabilities head on, primarily in creating a variety of DBMs that act as back-end processors, relieving the host computer of the burden of physical data management. The back-end DBM is a computer or processor specifically utilized to perform the data base management task for some other host computer or intelligent terminal. This host processor is frequently called the front-end and the data base processor is referred to as a back-end computer. The back-end DBM is not intended to be an independent computer; it reacts to, and is controlled by, a host computer.

Back-end processing is a fundamental system approach designed to improve performance and decrease the cost of data management. Back-end processing involves special software on a CPU or a DBM located between a host computer and the disk storage devices, as depicted in Figure D-2.

The performance of DBMSs employing hierarchical, network, or relational data base organizations can be enhanced significantly by the use of back-end processing. There are three types of back-end processors: virtual DBMs, dedicated DBMs, and specialized DBMs.

- The virtual DBM is a general-purpose computer combined with a software package to function as the DBMS. A virtual machine is a low-cost system because; (1) a general-purpose CPU is employed, and (2) data base management functions are shared with other functions such as compilation and transaction rates.

FIGURE D-2. BASIC DATA BASE MACHINE CONFIGURATIONS




- The dedicated processor is used exclusively to perform data base management functions. It is a general-purpose CPU, but it is physically distinct from the host CPU and is only required to support data base management functions. The speed and efficiency of the dedicated DBMS processor provides response times for queries or updates of the data base that are generally shorter than those for the virtual machines.

- The "specialized" DBM is specifically optimized to handle the functions of data base and disk management. The concept of a specialized back-end DBM takes maximum advantage of the data independence, which is a unique feature of relational systems. Further, such a machine, with the capability of specialized hardware support, promises to improve performance in supporting large, complex data bases in an interactive environment.

No one DBM is best for executing all types of queries, and DBMs are not cost-effective if the application supported is mainly overhead-intensive. For example,

NBS is still involved in testing back-end DBMs because they have not, to date, proven themselves in large systems with many sites.

D.3 Heterogeneous Distributed Data Base Management Efforts.

This section discusses four prototype development efforts currently underway in the DoD for interfacing heterogeneous DDBMS. A fifth effort under development at NBS and sponsored in part by the Navy is also reviewed. The area of heterogeneous DDBMS interfaces is experimental at this time, and all efforts are initially addressing retrieval capabilities. It will be some time before efforts will address the issue of updating heterogeneous DDBMSs.

D.3.a Army's MULTIBASE Prototype.

The Computer Corporation of America (CCA) has a contract with the Army Materiel Command (AMC) to develop a MULTIBASE front-end to two data bases resident on IBM mainframes (System 2000 DBMS and the Army's home-grown Data Manager Routine). "Intellect" will be used as a natural language front-end to generate Daplex (a semantic data model query language) commands to be read by MULTIBASE. MULTIBASE will run under the Digital Equipment Corporation VAX/VMS operating system and a gateway (hyperchannel) will be developed to interface the VAX 11/780 to the IBM hosts using the NEDEX hyperchannel protocol as the interface standard. The VAX is to be accessed over ARPANET [(Defense) Advanced Research Projects Agency Network]. The VAX at the Automated Logistics Management Systems Activity (ALMSA) in St. Louis, Missouri will be used for development of the system, with full production to be implemented on the VAX at the Armament Munitions and Chemical Command at Rock Island Arsenal in Illinois. The IBMs are also located at Rock Island, Illinois. A full Ada language conversion for MULTIBASE is being funded by AMC. A number of performance enhancements will be made, including the addition of a query interrupt capability.

D.3.b Air Force Integrated Design Support System.

A demonstration MULTIBASE prototype was to be completed by the end of Fiscal Year 1986 under a 2-year contract. The system will be implemented on a VAX 11/780. Questions as to technical feasibility, security considerations, and data dictionary incompatibilities must yet be addressed. The data dictionary is expected to require between 1 and 10 gigabytes of storage. Other considerations include network transaction management capability, file transfer, executive control system, and rules for configuration management. Some of these issues will be addressed in the prototype, but the prototype will not solve all the issues and is expected to identify additional ones.

Response time is an issue in any MULTIBASE implementation. Performance has not yet been addressed since resources have been committed to the development of other system features. As an interim measure, however, MULTIBASE can provide the user community with an ad hoc means to generate reports that today take 6 months to more than a year from request through implementation.

D.3.c NBS Integrated Manufacturing Distributed Data Base Administration.

The object of this NBS project is to identify and exercise potential standard interfaces between existing and future components of small batch manufacturing systems. It will also provide a laboratory for the development of factory-floor metrology in an automated environment, delivering proven measurement techniques and standard reference materials to American industry. Commercially available products are being used whenever possible to construct the facility in order to expedite transfer of research results into the private sector. This project is of particular interest because of the software being developed to support interfaces to a number of heterogeneous types of hardware.

The July 1986 prototype included interfaces between the VAX 11/785 computer and a SUN 6800 computer supporting the RIM (Boeing Computer Service's

Relational Information Manager) and INGRES (Relational Technology, Inc. relational DBMS) DBMSs, as well as flat file structures. Additional SUNs will be added as well as an interface to the IBM 4341 supporting SQL. The SUN, VAX, and IBM computers also support a variety of manufacturing hardware.

D.3.d Air Force Integrated Information Support System.

The testbed environment for this Air Force system, as initially developed by General Electric, as the prime contractor, and currently physically located at the Arizona State University, includes an IBM computer with IDMS as the DBMS, and a VAX 11/780 using ORACLE as the relational DBMS. A prototype is complete with interfaces to these two computers and DBMS configurations. Structural Dynamics Research Corporation is the major subcontractor who developed the user virtual terminal interface for this effort. It also has expertise in the area of CAD. Control Data Corporation is responsible for the development of the common data model processor that provides a neutral language for a single relational view across multiple DBMSs.

A number of vendors are interested in joining this effort. As a result, various additional hardware configurations will be added to the testbed, including Tandem, Hewlett-Packard, IBM 4341 and IBM 4381-XA, and Cyber 205.

D.3.e Naval Postgraduate School Multi-Lingual Data Base System (MLDS).

In MLDS the user does not have to convert a transaction from one data language to another. MLDS permits the user to run data base transactions written in different data languages. Hence, the user does not have to perform either a manual or automated translation of an existing transaction to execute the transaction in MLDS.

## APPENDIX E. GLOSSARY OF TERMS

The following is a list of acronyms and their definitions used in this report.

| | |
|---|---|
| ACO | Administrative Contracting Officer |
| ADAM | Aerial Port Documentation and Management |
| ADP | Automatic Data Processing |
| ADPSO | Automatic Data Processing Support Office |
| AFLC | Air Force Logistics Command |
| ALC | Air Logistics Center |
| ALMSA | Automated Logistics Management Systems Activity |
| AMC | Army Materiel Command |
| AMCL | Approved MILSTRIP[1] Change Letter |
| ANSI | American National Standards Institute |
| ARPANET | (Defense) Advanced Research Projects Agency Network |
| AT&T | American Telephone and Telegraph |
| ATCMD | Advance Transportation Control and Movement Data |
| AUTODIN | Automatic Digital Network |
| AUTOVON | Automatic Voice Network |
| bps | bits per second |
| CAD | Computer-Aided Design |
| CALS | Computer-Aided Logistics Support |
| CAM | Computer-Aided Manufacturing |
| CCA | Computer Corporation of America |
| CCSS | Commodity Command Standard System |
| CDC | Control Data Corporation |
| CDR | Contractor Deficiency Report |
| CINC | Commander-in-Chief |
| COBOL | Common Business Oriented Language |
| CODASYL | Conference on Data Systems Language |
| CONUS | Continental United States |
| CPU | Central Processing Unit |
| DAAS | Defense Automatic Addressing System |
| DAASO | Defense Automatic Addressing System Office |

[1] Military Standard Requisitioning and Issue Procedures.

| | |
|---|---|
| DAISY | DRMS Automated Information System |
| DAR | Destination Acceptance Report |
| DBM | Data Base Machine |
| DBMS | Data Base Management System |
| DCA | Defense Communications Agency |
| DCAS | Defense Contract Administration Service |
| DCASR | Defense Contract Administration Service Region |
| DCSC | Defense Construction Supply Center |
| DDBMS | Distributed Data Base Management System |
| DDF | Data Descriptive File |
| DDL | Data Definition Language |
| DDN | Defense Data Network |
| DEPRA | Defense European and Pacific Redistribution Activity |
| DFARS | Defense Federal Acquisition Regulation Supplement |
| DIAL | Data Interchange at the Application Level |
| DIDS | Defense Integrated Data System |
| DLA | Defense Logistics Agency |
| DLANET | Defense Logistics Agency Telecommunications Network |
| DLSC | Defense Logistics Services Center |
| DLSS | Defense Logistics Standard Systems |
| DLSSO | Defense Logistics Standard Systems Office |
| DML | Data Manipulation Language |
| DMS | Data Management System |
| DoD | Department of Defense |
| DoDAAD | Department of Defense Activity Address Directory |
| DoDAAF | Department of Defense Activity Address File |
| DoDD | Department of Defense Directive |
| DoDI | Department of Defense Instruction |
| DRMO | Defense Reutilization and Marketing Office |
| DRMS | Defense Reutilization and Marketing Service |
| DTS | Defense Transportation System |
| EBDI | Electronic Business Data Interchange |
| EXPRESS | (Data) Extraction, Processing, and Restructuring System |
| FAA | Federal Aviation Administration |
| FAD | Force Activity Designator |
| FAR | Federal Acquisition Regulation |
| FEP | Front-End Processor |

| | |
|---|---|
| FIRMR | Federal Information Resources Management Regulation |
| FMS | Foreign Military Sales |
| 4GL | Fourth-Generation Language |
| FSC | Federal Supply Class |
| GBL | Government Bill of Lading |
| GP | Gateway Processor |
| GSA | General Services Administration |
| IBM | International Business Machines Corporation |
| ICF | Interchange Form |
| ICP | Inventory Control Point |
| IDC | In-transit Data Cards |
| IGES | Initial Graphics Exchange Specification |
| IGP | Intelligent Gateway Processor |
| ILCS | International Logistics Communications System |
| IM | Inventory Manager |
| IMM | Integrated Materiel Manager |
| IRIS | Interrogation Requirements Information System |
| IRM | Information Resources Management |
| ISDN | Integrated Services Data Network |
| ISO | International Standards Organization |
| JCS | Joint Chiefs of Staff |
| JDA | Joint Deployment Agency |
| JDS | Joint Deployment System |
| JOPES | Joint Operations, Planning, and Execution System |
| kbps | kilobytes per second |
| L&MM | Logistics and Materiel Management |
| LAN | Local Area Network |
| LASE | Logistics Assets Support Estimate |
| LIDS | Logistics Information Data Service |
| LIF | Logistics Intelligence File |
| LOGDESMAP | Logistics Data Element Standardization and Management Program |
| LOGDRMS | Logistics Data Resource Management System |
| LOGNET | Logistics Network |
| LSAO | Logistics Systems Analysis Office |

| | |
|---|---|
| M3S | Marine Corps Standard Supply System |
| MAC | Military Airlift Command |
| MAISRC | Major Automated Information System Review Council |
| MAPAD | Military Assistance Program Address Directory |
| MAPAF | Military Assistance Program Address File |
| MCDN | Marine Corps Data Network |
| MCWI | Motor Carrier Waybill Interchange |
| MILSBILLS | Military Standard Billing System |
| MILSCAP | Military Standard Contract Administration Procedures |
| MILSPETS | Military Standard Petroleum System |
| MILSTAMP | Military Standard Transportation and Movement Procedures |
| MILSTEP | Military Supply and Transportation Evaluation Procedures |
| MILSTRAP | Military Standard Transaction Reporting and Accounting Procedures |
| MILSTRIP | Military Standard Requisitioning and Issue Procedures |
| MLDS | Multi-Lingual Database System |
| MODELS | MOdernization of DEfense Logistics Standard Systems |
| MOV | Materiel Obligation Validation |
| MRAD | Materiel Receipt Acknowledgment Document |
| MRASDRS | Materiel Receipt Acknowledgment and Supply Discrepancy Reporting System |
| MRC | Materiel Release Confirmation |
| MRO | Materiel Release Order |
| MRP | Materiel Returns Program |
| MSC | Military Sealift Command |
| MTMC | Military Traffic Management Command |
| MTMR | Military Traffic Management Regulation |
| NARF | Naval Air Rework Facility |
| NASA | National Aeronautics and Space Administration |
| NAVSUP | Naval Supply Systems Command |
| NBS | National Bureau of Standards |
| NDL | Network Database Language |
| NMCS | Not Mission Capable Supply |
| NSC | Naval Supply Center |
| NSN | National Stock Number |

| | |
|---|---|
| OCONUS | Outside the Continental United States |
| O-D | Origin-Destination |
| ODASD(L&MM) | Office of the Deputy Assistant Secretary of Defense (Logistics and Materiel Management) |
| OJCS | Organization of the Joint Chiefs of Staff |
| OMB | Office of Management and Budget |
| OSD | Office of the Secretary of Defense |
| OSI | Open Systems Interconnection |
| PAD | Packet Assembler/Disassembler |
| PC | Personal Computer |
| PCO | Procurement Contracting Officer |
| PICA | Primary Inventory Control Activity |
| PIP | Physical Inventory Program |
| PMCL | Proposed MILSTRIP Change Letter |
| POM | Program Objective Memoranda |
| PPBS | Planning, Programming, and Budgeting System |
| QDR | Quality Deficiency Report |
| R&D | Research and Development |
| R&M | Reutilization and Marketing |
| RDD | Required Delivery Date |
| RDF | Revised Delivery Forecast |
| RDL | Relational Database Language |
| RM | Reference Model |
| ROD | Report of Discrepancy |
| RWI | Rail Waybill Interchange |
| S/A | Service/Agency |
| SAMMS | Standard Automated Materiel Management System |
| SC&D | Stock Control and Distribution |
| SICA | Secondary Inventory Control Activity |
| SIWSM | Secondary Item Weapons System Management |
| SMPG | Supply Management Policy Group |
| SPAR | Stock Point ADP Replacement |
| SPLICE | Stock Point Logistics Integrated Communications Environment |

| | |
|---|---|
| SPN | Shipment Performance Notice |
| SPR | Special Program Requirement |
| SQL | Structured Query Language |
| | |
| TCMD | Transportation Control and Movement Data |
| TCN | Transportation Control Number |
| TCO | Termination Contracting Officer |
| TDR | Transportation Discrepancy Report |
| TOA | Transportation Operating Agencies |
| | |
| UCS | Uniform Communications Standard (for retail food industry) |
| UMMIPS | Uniform Materiel Movement and Issue Priority System |
| | |
| WBS | Work Breakdown Structure |
| WINS | Warehouse Information Network Standards |
| WWMCCS | Worldwide Military Command and Control System |

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Improvements in information management and information processing and communications have made the existing Defense Logistics Standard Systems (DLSS) appear cumbersome, inflexible, and obsolete. The goal of the DLSS is to provide standard policies, procedures, and transaction formats to facilitate effective communication of vital logistics information between the Services and Agencies of the Department. To continue to achieve this goal, the DLSS must be modernized to be more flexible in handling information and more dynamic to accommodate operational and informational change requirements.

This report of DLSS functional requirements for modernization describes how information technology improvements affect (1) inter-Service/Agency information exchange requirements, (2) requirements of logistics managers for new forms and formats of logistics information, and (3) requirements for additional standards that will encourage effective use of the technology and information exchange improvements.


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